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RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY,

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS

FROM JULY 1, 1870, TO JUNE 30,

1871.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL
CONFERENCE

AT THE

EIGHTH ANNUAL MEETING

HELD AT

EDINBURGH,

AUGUST, 1871.



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YEAR-BOOK OF PHARMACY.

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LIST OF CONTENTS.

	PAGE
Introduction	1
Materia Medica	17
Pharmaceutical Chemistry	117
Pharmacy	349
Notes and Formulæ	427
Bibliography	453
Constitution and Rules of the British Pharmaceutical Conference. . . .	471
Honorary Members of the Conference.	472
Alphabetical List of Members of the British Pharmaceutical Conference. .	473
" " Towns at which Members reside	506
Local Associations	523
Presentation Copies of the Year-Book, to whom forwarded	524
Transactions of the British Pharmaceutical Conference	525
General Index	641

INTRODUCTION.

IN the compilation of the present Year-Book, the aim has been to bring together from the various Journals published in different parts of the world, an account of those papers which are likely to be of practical utility to the pharmacist in the exercise of his calling, or of scientific interest to the student of pharmacology. The articles thus collected have been divided into four sections ; the first of these is devoted to information relating to substances of the animal or vegetable *Materia Medica* ; the second part embraces, under the title of *Pharmaceutical Chemistry*, those papers treating of definite compounds, or referring to purely chemical processes ; the third, or *Pharmacy* section, comprises all galenical preparations ; and the fourth comprehends, under the general heading of *Notes and Formulæ*, memoranda of subsidiary value, but which may be nevertheless suggestive and useful.

Taking a retrospective view of the more important results of the past year, which are thus recorded in the following pages, it will be found that many valuable additions to pharmaceutical knowledge have been contributed by workers both at home and abroad, whereby the progress of pharmacy, as a scientific art, has been materially promoted.

Perhaps the most important task which the pharmacist has to accomplish, is to obtain from the crude drugs their medicinally active constituents in a liquid form, convenient for administration. The tendency of modern pharmacy has been to obtain this fluid representative of the natural drug in as concentrated a form as possible ; and liquid extracts are now largely used. In America especially this subject has undergone extensive development. At the last meeting of the American Pharmaceutical Association, a most valuable memoir by Dr. Squibb was read, giving the results of an elaborate investigation into the efficiency of the process of percolation by which these preparations are usually obtained. The author appears to consider that a fluid extract, one minim of which is to represent a grain of the drug, ought to contain 80 per cent. of the total amount of extract obtainable from this drug by the solvent employed. Where simple

percolation is resorted to without subsequent concentration, he shows that this result is quite unattainable. The percolation of coarse powders he regards as a delusion; and where fine powders are uniformly employed, he proves by careful quantitative experiments, that the rate of exhaustion varies greatly with different materials, rendering it necessary to study each substance independently. Maceration he finds to be comparatively useless at the commencement of the process of percolation, but useful after the substance has been partially exhausted. Submitting a pound of a drug to percolation in the most efficient manner, 80 per cent. of the total extract it can yield will never be contained in the first pint of percolate, but is contained in a number of pints never less than $2\frac{1}{2}$ nor more than 11.

To prepare fluid extracts without heat, which shall be of the strength he prescribes, it is necessary to resort to a process of repercolation, that is to say, percolating fresh portions of the drug with percolate from previous portions, until the proper strength is obtained. The principal inconvenience of this method of operating, is the necessity of reserving a stock of weak percolate of different densities from one operation to the next for each fluid extract. The author estimates the amount of extract in solution, by the difference in weight between a pint of the menstruum employed, and a like volume of the percolate obtained. An extensive series of quantitative results so obtained are included in the paper, and give great importance to Dr. Squibb's researches, which constitute an important addition to scientific pharmacy.

American pharmacutists frequently make an addition of glycerine or sugar in the preparation of fluid extracts. The occasional utility of this practice probably receives some explanation from the experiments of M. T. Defresne, who shows that cinchonic red, the astringent matter which separates from watery decoctions of bark, is permanently soluble in syrup. Based upon the knowledge of this fact, M. Defresne has published an improved process for a syrup of cinchona, whereby the cinchonic red, which possesses aromatic tonic properties, is retained in solution. M. Rabelle has also founded upon it a new formula for cinchona wine.

Although apparently one of the simplest operations in pharmacy, a great deal has been written from time to time on the preparation of infusions, and a useful summary of the literature on this subject has been lately furnished by Mr. Allchin.

From some careful experiments by Mr. J. B. Barnes, described at a pharmaceutical meeting, held November, 1870, we learn that the time necessary for the maceration of infusions may be in all cases reduced

to one half, and in some cases even less, without in the slightest degree reducing the strength of the resulting liquor. This result will be a source of satisfaction to a great many dispensers, who dislike the use of concentrated preparations.

A new menstruum for the preparation of solid extracts, is gradually attracting some attention. Sulphide of carbon has been used frequently for extracting oils and fats from vegetable substances, and has proved a most efficient agent for the purpose. Moreover, M. Millon has stated that by employing the sulphide in a state of great purity, the odorous principles of flowers may be thus extracted and isolated without injury; the sulphide of carbon evaporating perfectly away at a low temperature, leaving the perfume uncontaminated. M. Lefort has recently published the results of some experiments on the preparation of extracts from medicinal herbs with this solvent. He has operated on the dried leaves of belladonna, henbane, aconite, conium, etc., and has obtained extracts which, he states, retain in a remarkable degree the medicinal activity of the original herb. In those made from belladonna and aconite, he has proved the presence of alkaloid by chemical evidence. These extracts, which he terms sulpho-carbonic extracts, possess a powerful odour of the fresh plant, and are especially suited for the preparation of medicated oils, ointments, etc., because they are entirely soluble in fatty menstrua. Such oils are not much employed in English pharmacy, but it is possible that an extract prepared by M. Lefort's process, might afford an elegant and efficient method of making belladonna plaster. Mr. A. E. Ebert recommends a process based upon a similar principle for the preparation of ceratum sabinæ. This cerate being only occasionally asked for, is apt to have lost its colour, and not be in a good condition when required for use. Mr. Ebert, therefore, extracts the oleo-resin from savin, by means of ether, and preserves the ethereal extract, with which the cerate can be immediately prepared when needed.

The result of Dr. Harley's exhaustive researches into the comparative medicinal efficacy of the different preparations of conium, shows that the green fruit possesses a clear and decided superiority over every part of the plant; it is probable, therefore, that in course of time the present extract of conium will be replaced by an alcoholic extract of the green fruit. Professor von Schroff, of Vienna, states that it is the unripe fruit of the two-year old plant which contains the most conia, while the unripe fruit of the first year contains the least, and the proportion of alkaloid in the ripe fruit of the second year is intermediate between these two.

It is well known that the first year's growth of henbane is very inferior in medicinal activity to the second year's plant. On this account, the biennial herb should alone be used in the preparation of tincture. Nevertheless, the annual leaves are constantly to be met with in commerce, and their relative cheapness offers an inducement to employ them in place of the biennial leaves and tops which are alone recognised in the Pharmacopœia. Mr. Donovan has described a simple means of distinguishing a tincture of the annual, from one prepared with the biennial plant. The first forms a clear, while the latter yields a slightly milky mixture, when a small quantity is added to a glass of water.

Mr. W. W. Stoddart in his admirable articles on Bristol Pharmacology also states that the tincture made from the biennial plant may be immediately distinguished by the use of the microspectroscope. Five dark bands are distinctly seen, which are not visible in the tincture from the annual plant. They are so well marked, that he instances henbane-tincture as a beautiful object for exhibition on a screen by the electric or oxyhydrogen light.

The effect of soil and cultivation on the activity of medicinal plants is a subject which has been frequently discussed among pharmacentists, and Professor Bentley, Mr. Squire, and others, have pointed out how great a variation may thus be caused in the efficacy of our indigenous drugs. In a recent article Mr. M. C. Cooke brings forward some reasons for regarding rapid growth, with a plentiful supply of moisture, as very unfavourable to the development of those properties in leaves which are of value in medicine. He considers the chemical constituents of the soil as having little influence on the formation of active principles, compared to the effect of slow growth induced by the absence of moisture.

The cultivation of the more important medicinal plants in different parts of the world is still receiving careful study. Mr. J. S. Ward has given an account of some good samples of opium obtained from poppies grown in Australia; and the cultivation of cinchona in India still makes satisfactory progress. One of the most important facts connected with the latter subject is the hybridization recently described by Mr. Broughton as occurring amongst certain species, whereby more hardy plants, rich in alkaloid, are likely to be obtained. Attention has also been directed to the importance of cultivating the ipecacuanha plant in India. Several specimens are now living in the Botanic Gardens at Calcutta, but unfortunately the plant is naturally very slow in its growth. Meanwhile Mr. M. C. Cooke suggests the desirability of trying some indigenous Indian

plants as a substitute for this drug. He especially instances the leaves of the *Tylophora asthmatica* as possessing a native reputation for emetic and expectorant properties.

An interesting account of the *Ophelia chirayta* has been published during the past year by Professors Flückiger and Höhn, in which the authors give the results of an important chemical examination of the plant, showing that it contains a peculiar neutral bitter obscurely crystalline principle, chiratin, which by the action of acids is split up, yielding an acid, ophelic acid, also present in the plant.

From the labours of Professor Flückiger we have also gained an important addition to our knowledge of the crystalline constituent of aloes. He finds that a variety of this drug, known in commerce as Natal aloes, contains a principle differing in several respects, and notably by its greater insolubility, from the aloïn derived from other kinds of aloes. This substance he names nataloïn. It has the composition $C_{34}H_{38}O_{15}$, which is Stenhouse's formula for hydrated aloïn; but the crystals of nataloïn are anhydrous. When its solution in concentrated sulphuric acid is exposed to the vapour of fuming nitric acid, a fine green colour is developed, quickly changing to red and blue. It further appears from the author's researches that the aloes of Zanzibar yield crystals which are again distinct from either of the foregoing bodies.

The chemistry of the bearberry has been carefully investigated by Mr. J. Jungmann. He finds the leaves to contain arbutin, a crystalline principle also present in the winter-green; ericolin, a glucoside resin, which, by splitting up, yields a volatile oil, named ericinol; and urson, a neutral, inert, crystalline body.

The *Eucalyptus globulus*, a plant of the order Myrtaceæ, has been a subject of recent study. Dr. Lorinser gives the result of his trials with a tincture of the leaves in cases of intermittent fever. Dr. Gimbert has also used the leaves for dressing wounds in place of lint. In last year's "Year-Book" will be found an account of some researches by M. Cloez into the chemistry of the essential oil derived from this plant, which is now being used in perfumery. It consists chiefly of a liquid body, eucalyptol, closely allied to camphor, being homologous to the latter in composition, but standing two steps higher in the series.

In a very learned paper, read before the Linnæan Society by Dr. G. Birdwood, the botanical and geographical sources of olibanum are accurately defined. Contrary to the statements in our works on *Materia Medica*, it appears that no olibanum is produced in India, that country being merely the route by which it reaches Europe.

The author shows that this drug, which has been in use from the very earliest times, is produced along the Hadramaut mountains in Arabia, and also in the Soumali district of Africa. It is yielded by two species of *Boswellia* (*B. Casterii* and *B. bhau-dajiana*) now described for the first time by the author; the Indian plant, *B. thurifera* (or *serrata*), hitherto regarded as the source, really furnishing none of the olibanum of commerce.

For some time past a cheap description of saffron has been commonly met with in commerce, under the name of "Alicante saffron." Mr. D. Hanbury has done good service by calling attention to this article. He finds it consists of ordinary saffron fraudulently adulterated with carbonate of lime, which has been ingeniously made to adhere without altering the general appearance of the drug. As much as 10 or 20 per cent. of chalk is thus introduced.

The existence in commerce of a peculiar variety of rhatany root has been pointed out by Professor Flückiger. It comes from Para, and possesses a colour very different from that of Payta or Savanilla rhatany. Its substitution for the latter the author considers to be inadmissible.

Mr. C. R. C. Tichborne has pointed out that in the process of the Pharmacopœia for liquor epispasticus, a mistake has evidently been made in the acid ordered to be used. The Pharmacopœia simply directs "acetic acid," which would mean the ordinary acid of sp. gr. 1.044. But this acid is not miscible with ether, and moreover there is a want of solubility of cantharidin in this acid when cold. By using half the quantity of glacial acid in its place a rapidly vesicating and homogeneous fluid is obtained. He also indicates a simple and elegant method of preparing a vesicating collodion from this liquor, by simply dissolving in it some pyroxylin.

Partly in consequence probably of the present high price of cantharides, other blistering flies are receiving some attention. An article will be found in the *Materia Medica* section, by Mr. F. Porter Smith, describing the vesicating insects used in China. The *Mylabris cichorii*, or Chinese blistering fly, is abundant in English commerce, and is extensively used in veterinary practice. It is by many thought to be a very efficient vesicant. A paragraph has gone the round of pharmaceutical periodicals, asserting that the small or immature cantharides are very deficient in blistering power.

A useful table has been published by Mr. Umney, showing the amount of spirit lost in making each of the Pharmacopœia tinctures, when operating under the most favourable circumstances. The principal obstacle to the preparation of tinctures on the small scale,

is the loss of spirit incurred through the want of an efficient press for recovering the liquid retained in the marc. Mr. Staples has described an ingenious instrument for this purpose, which could be easily constructed for a small sum, and is calculated to give much more power than the form of tincture press usually sold.

The preparation of suppositories often occasions considerable trouble to the dispenser, especially in hot weather, when the fatty basis will not readily solidify. Mr. G. W. Ewing, states that suppositories may be well made by mixing the ingredients in a mortar, after the manner of a pill mass, instead of melting them together. For this purpose he reduces the cacao butter and white wax to coarse powder, by grating them, and keeps them in stock in this state. It is thus easy to adjust the relative proportions of these ingredients, according to the requirements of the moment, and by beating in the mortar, or working in the fingers, the mass is rendered sufficiently plastic to be easily pressed into the mould.

No doubt operating by fusion, the dispenser is under a temptation to unduly augment the proportion of wax, thereby raising the melting point of the product above what it should be. Mr. Eberle, in an article on the subject, has reprobated this practice, and recommends the use of cacao butter alone, wherever it is practicable.

A modification of the ordinary process for preparing nitrate of mercury ointment, has been introduced by Mr. R. Rother. He proposes to dissolve the mercury in part of the nitric acid, while the lard is heated with the remainder at a gentle heat, until all action ceases; the two products are then mixed together. The fatty basis of this ointment prescribed in the United States Pharmacopœia, is a mixture of lard and neat's-foot oil; but Mr. Rother employs lard only.

The kinds of soap best suited for employment in pharmacy are beginning to attract attention. During this year Mr. F. M. Rimington has suggested the preparation of medicinal soap from castor oil. He finds that the soap so prepared has of itself sufficient aperient power to relax the bowels when taken consecutively for several days. One of the principal uses of soap in pharmacy is as an adjunct to other aperients in making pills; castor oil soap would therefore appear well adapted to this purpose. The employment of soap in conjunction with colocynth, etc., seems to have a positive physiological effect. From the experiments of C. M. G. Zwicke and others, it results that the action of convolvulin and jalapin is due to their solution in bile, the employment of soap imitating this action. Such being the case, it might be worth consideration whether

purified gall, which is a natural soap, the choleate of soda, would not advantageously replace ordinary soap in such pill masses. It can be readily got in considerable quantity at a very moderate cost if required.

Mr. Rimmington states that castor oil soap is entirely and permanently soluble in proof spirit; in this respect therefore it resembles the almond oil soap suggested last year, and described in the "Year-Book of 1870." But a soap which is well suited for making soap liniment is necessarily ill adapted to certain other preparations. Curd soap must necessarily enter the Pharmacopœia, if *Linimentum Potassii Iodidi c. Sapone* is to be retained and made in accordance with the original formula; moreover curd soap is also the most convenient to employ for the preparation of compound extract of colocynth, because the resulting product is more easily powdered, and the powder has less tendency to aggregate into a mass again than when castile soap is used.

An account of a new preparation, called "liquid iron soap," comes to us from Germany. It is said to be made by dissolving recently precipitated hydrated oxide of iron in oleic acid, and, as in the case of the saccharated oxide of iron, solution is much facilitated by a small quantity of alkali. Iron soap is described as a brownish red syrup which dissolves in water.

Dr. Van der Corput of Brussels has also suggested a lime-soap of cod liver oil for administration in place of the oil, and speaks highly of its effects.

From the classical researches of Graham on Diffusion, we learnt some years back, that peroxide of iron may be obtained in a colloidal condition soluble in water. Professor Graham obtained this solution by dissolving an excess of moist peroxide of iron in ferric chloride, and then dialyzing the liquid; chloride of iron diffused away, and an aqueous solution of the pure ferric-hydrate was left. It has also long been known that sugar acts like citric and tartaric acids in preventing the precipitation of oxide of iron, by an alkali. A knowledge of these facts has led to various attempts to prepare a soluble oxide of iron for use in medicine. One of the best processes for this purpose, is that published by M. Siebert. A solution of perntrate of iron is mixed with syrup, and an excess of ammonia added; by the addition of alcohol to this liquid, a precipitate is thrown down, containing the oxide of iron, associated with sugar. This precipitate is washed with spirit to remove the nitrate of ammonia, and dried at a gentle heat. When freshly prepared, it is soluble in water, especially in presence of a trace of free ammonia.

From this preparation, a syrup, holding the iron in permanent solution, may be made. Such a syrup may also be prepared from the solution of ferric-hydrate obtained by dialysis. On the continent, soluble saccharate of iron, either in the solid or liquid form, has been introduced into pharmacy with some success; the syrup generally containing about 1·4 per cent. of anhydrous oxide of iron.

The syrup of phosphate of iron and allied syrups often occasion considerable trouble to the pharmacist. Mr. M. Carteighe has given a set of practical formulæ intended to facilitate the production of these preparations. He dissolves the dry phosphates in syrupy phosphoric acid, and then adds simple syrup. Since these preparations have come so extensively into use, the introduction of a stronger phosphoric acid into the Pharmacopœia would be attended with great advantage.

A most important and elaborate investigation into the compounds of carbonic acid and ammonia has been made by Dr. Divers, whereby our knowledge of these bodies has been very much increased.

The author has shown that the normal carbonate of ammonia (NH_4), CO_2 , H_2O can be readily obtained in a definite crystalline condition. This body, which, according to the old system of notation, would be represented as $\text{NH}_4 \text{O CO}_2$, H O , was not known in the solid form to chemists previous to the author's investigations, although it now appears that Dalton had prepared the salt in 1813. It separates in minute crystals when commercial carbonate of ammonia is digested with strong solution of ammonia, and may be got in distinct prisms or plates. It is characterised by its sparing solubility in solution of ammonia, although it is soluble in its own weight of pure water. No doubt this is the body which is obtained by the process which Mr. Allchin published many years ago for the preparation of smelling salts.

The author also gives elaborate details of the preparation, properties, and composition of the other carbonates of ammonia which admit of being obtained in crystals from solution. These bodies form a regular series as follows:—

Normal carbonate	$(\text{CO}_2)_2 (\text{OH}_2)_4 (\text{NH}_3)_4$
Half acid ditto	$(\text{CO}_2)_3 (\text{ON}_3)_4 (\text{NH}_3)_4$
Acid ditto	$(\text{CO}_2)_4 (\text{OH}_2)_4 (\text{NH}_3)_4$
Rose's ditto	$(\text{CO}_2)_5 (\text{OH}_2)_4 (\text{NH}_3)_4$

Some valuable remarks on the constitution of these carbonates will be found in the author's paper, and are noticed in our abstract.

One of the most important results of the author's investigations, however, relates to the formation of ammonium carbamate. It is well known that this body is formed by the combination of dry carbonic acid and ammonia gases, and has the composition NH_4CO_2 . The author shows that this compound equally well forms in the presence of water, and can be crystallised from solution. By passing ammonia and carbonic acid gases into a cold saturated solution of ammonia, combination occurs, and the carbamate ultimately deposits in crystals. Moreover, by the action of an excess of a cold and highly saturated solution of ammonia prolonged for thirty or forty hours, any of the carbonates of ammonia are converted into the carbamate. It is an interesting fact that this compound, when exposed freely to the air, gradually deliquesces. It has been generally represented that the carbamate evaporates entirely away on exposure to the air; but Dr. Divers observes that it leaves a small residue of acid carbonate, amounting to about two per cent. of the original weight, and owing its formation to the moisture absorbed. The distinguishing reaction between ammonium carbamate and ammonium carbonate is that added *in excess* to ammonia and calcium chloride, the carbamate precipitates the calcium very slowly, while the carbonate precipitates it immediately.

Another most important result of these researches is to correct our formula for commercial carbonate of ammonia. It appears that the composition generally assigned to this salt is incorrect. The carbonate now found in commerce possesses the formula $(\text{CO}_2)_2 \cdot \text{OH}_2 \cdot (\text{NH}_3)_2$, and is very uniform in composition. It contains more ammonia therefore than is ascribed to it by the formula hitherto in use. Translated into the old notation the corrected formula becomes $3 \text{NH}_3 \cdot 2 \text{H}_2\text{O} \cdot 4 \text{CO}_2$, which is more complex than the one hitherto used. The author seems inclined to think that this result is due to a change in the composition of the carbonate of commerce, and not to any error of former analyses. He thinks that the carbonate now in commerce differs from that most generally in commerce formerly. The constitution of the present salt may be regarded as that of a double salt of carbonic and carbamic acids— $\text{CO}_2 \cdot \text{NH}_4 \cdot \text{H} \cdot \text{C}(\text{NH}_2) \text{O}_2 \cdot \text{NH}_4$.

The products formed by the reduction of nitric acid have also received important elucidation. M. E. Fremy and M. Lossen have shown that when nitrous or nitric acid is added to a mixture of hydrochloric acid and tin, a powerful reducing body is developed, in small quantity, having the composition NH_2O , and named by M. Lossen oxy-ammonia. It may be regarded as nitrous acid

HNO_3 , in which two atoms of hydrogen are replaced by one atom of oxygen. Dr. Divers has also shown that when excess of sodium amalgam is gradually added to a *cold* solution of nitrate of soda, an alkaline liquid is formed, which contains a new body, a salt of nitrous oxide, having the composition NaN O . This salt, heated with acetic acid, evolves nitrous oxide. It also precipitates nitrate of silver, forming an insoluble compound of the formula Ag N O .

Our knowledge of the constitution of the hyposulphites has received an important correction from the experiments of Mr. E. A. Letts. These salts have generally been regarded as containing the elements of one molecule of water intimately associated in their constitution. The author shows, however, that this is not the fact; the sodium salt for instance losing the whole of its five molecules of water at 100°C . without further decomposition. The formula of this compound should therefore be written $\text{Na}_2 \text{S}_2 \text{O}_3 \cdot 5 \text{H}_2 \text{O}$.

A discussion on the chemical nomenclature best suited to the requirements of the Pharmacopœia, which shall at the same time be in accordance with the recent developments of chemical science, has been inaugurated by Dr. Attfield. To bring the names of salts of the alkali and earthy metals into harmony with those of other metallic salts is a change obviously needed, and forcibly advocated by the professor. Nothing but long usage can justify the employment of the names sulphate of potash and sulphate of magnesia, instead of sulphate of potassium and sulphate of magnesium. A change to this extent would occasion no inconvenience, and will certainly be adopted in a future Pharmacopœia.

A peculiar form of starch has been described by F. A. Flückiger, under the name of *lerp-amylum*. It is the principal constituent of the manna found on the leaves of *Eucalyptus dumosa*, and is produced by an insect, the *Psylla eucalypti*. The properties of this substance appear to be intermediate between those of starch and cellulose.

Iodide of starch is occasionally used in French pharmacy, chiefly in the form of syrup, and a process has been given by A. Petit, whereby this compound can be readily prepared of definite composition. He states that when an excess of an ethereal solution of iodine is evaporated over starch, and the residue heated to 100°C . for some time, the product has the composition $(\text{C}_{10} \text{H}_{18} \text{O}_6)_{10} \text{I}$, and is entirely soluble in warm water.

Inulin has been the subject of careful study by more than one chemist. M. Lefranc has studied the changes which inulin undergoes in the living plant, and shows that during the winter it

experiences a modification whereby it is transformed into a soluble body, lævo-rotary like inulin itself, and an uncrystallisable optically inactive sugar; the latter he names inulose, and the former levuline. O. Popp has also worked at the same subject, and has apparently arrived at the same conclusions, having isolated a body closely resembling inulin, but differing from it by its greater solubility in water. This body he calls inuloid. He has also obtained from the tubers of plants rich in inulin, a sugar which is uncrystallisable and optically inactive—synanthrose. This sugar he finds most abundantly in the ripe tubers.

M. Musculus has described the production of a form of dextrin which is insoluble in water. It is obtained by the action of glacial acetic acid on starch, but may be also formed by other means. By prolonged digestion with water at 100° C. it is dissolved; but the solution evaporated to a syrup, and allowed to stand, gradually deposits the dextrine in a granular form which is insoluble in cold water. Its reactions are identical with those of ordinary dextrine.

The manufacture of glucose, or grape-sugar, is now conducted upon a very large scale, especially in America. It is made by the action of dilute sulphuric acid upon starch, and is imported into this country in large solid blocks, and also in the form of a thick uncrystallisable syrup. Its largest consumption appears to be among confectioners, brewers, and spirit distillers. This sugar is likely to prove a useful agent in pharmacy. The formation of grape-sugar in syrup of iodide of iron, prevents the decomposition which otherwise occurs on contact with air; it is fair to assume, therefore, that glucose might be advantageously employed in its preparation. Its use in *syrupus ferri phosphatis*, and other acid syrups, is also well worth a trial. Of course, when cane-sugar is employed in these preparations it is gradually transformed into glucose by the action of the acid. M. Hardy shows indeed that all syrups made with the purest cane-sugar, contain more or less glucose, and that the proportion increases notably with age.

Some improvements have also been suggested in the processes for the estimation of grape-sugar. M. Loewe proposes to replace the tartaric acid in the ordinary cupro-tartrate solution by glycerin, whereby the test liquor is rendered permanent in strength. M. Carl Knapp introduces an entirely new method, which is based on the reduction of cyanide of mercury, by grape-sugar, in presence of an alkali. The liquid to be tested, is dropped into a given quantity of a standard solution of cyanide of mercury in caustic soda, until the metal is completely precipitated.

The rapidity with which hydrate of chloral has passed into general use as a remedial agent must have considerably taxed the producing powers of its manufacturers. It is now generally admitted, however, that most of the chloral found in commerce has been sufficiently pure and good in quality, although of course inferior samples were frequently met with. The test introduced by Mr. Umney has served a very useful purpose by affording the means of maintaining a certain standard of excellence. The substitution of alcoholate for hydrate, which was at first suggested, has not been found to occur; and experience has shown that the principal cause of variation in the chloroform-yielding power of commercial chloral has been the presence of a little more or less water. Free hydrochloric acid has been occasionally present, but this generally manifested itself to the senses, and besides was readily detected by the addition of a little nitrate of silver. Looking to the future, however, we should bear in mind that the chloroform test, while it insures a certain degree of uniformity in the product, fails as an indicator of absolute purity, and must not, therefore, be too implicitly relied upon. The action of chlorine upon alcohol is very intricate, and gives rise to a number of intermediate and subsidiary products, which, if they are not carefully separated, may contaminate the chloral, and injure its medicinal efficacy, without very materially affecting the indications of the ammonia test. Moreover, much of the alcohol of commerce contains impurities which, when acted on by chlorine, may yield products still further complicating the result. Thus aldehyd, which is generally present in German spirit, has been shown to yield, with chlorine, a crystalline body resembling chloral hydrate, but which is the chlorine derivative of crotonic aldehyd.

The chemistry of the cinchona barks has received further elucidation in the discovery of a new alkaloid, isomeric with quinine, by Mr. David Howard. A new process for the assay of barks has been published by M. P. Carles, which is likely to prove useful to the pharmacist. The author mixes the bark into a paste with milk of lime, which is then dried and percolated with chloroform. By evaporating or distilling the resulting solution, all the alkaloids of the bark are obtained. He estimates the proportion of quinine in these by separating it in the form of crystallised disulphate.

Dr. de Vrij has also contributed a suggestive paper on the possibility of estimating the proportions of the alkaloids in a bark by their different rotating power on a ray of polarized light.

It is well known that the quinine in cinchona bark is always accompanied by an uncrystallisable modification of the alkaloid.

M. P. Carles has made some interesting experiments on the conditions favourable to the production of this amorphous quinine, from which we learn that heat, light, and moisture promote its formation; bark exposed in powder to the sun, having some of the quinine it contains rendered uncrystallisable.

Hyoscyamine has been the subject of further study by Höhn and Reichardt. Henbane seeds yielded them 0.04 per cent. of this alkaloid, which they have obtained, together with several of its salts, sufficiently pure for analysis. By boiling for several hours with baryta water, it breaks up into a crystallisable acid (hyoscinic acid) and an amine base (hyoscine).

A natural vegetable alkaloid has for the first time been produced artificially. H. Schiff has announced the synthesis of conia, which he obtained by the dry distillation of dibutyraldin, a body resulting from the action of an alcoholic solution of ammonia on butyric aldehyd.

Some attention has been paid during the past year to improving the preparation of pepsine. Mr. Tuson and others have shown that this substance, as it at present exists in commerce, varies very considerably in its solvent or digestive power, and is often of doubtful medicinal efficacy. Dr. Beale states that a highly active preparation is readily obtained by quickly drying the mucus expressed from the stomach glands upon glass plates. Other experiments have shown that pepsine is freely soluble in glycerine, and that by simply macerating the mucus membrane of the pig's stomach in this fluid, a liquid is obtained which keeps well and possesses powerful digestive properties.

MATERIA MEDICA.

YEAR-BOOK OF PHARMACY.

PART I.

MATERIA MEDICA.

Chinese Blistering Flies. F. Porter Smith, M.B. Lond., M.R.A.S. (*Med. Times and Gaz.*, 1871, i., 689.) The entomology of China is not peculiarly rich, when we bear in mind its semi-tropical character as a climate. The extreme, or considerable, cold of the country proves fatal to the crowds of insects which infest the house and the field, but of which a mere salvage is saved to renew the sorts. In no country, however, is so much wealth gathered from the labours of insects as in China. The *Coccus lacca*, which produces the gum-lac; the *Coccus pehlah*, which secretes the spermaceti-like wax of Chinese pharmacy; the *Coccus manniparus*, which prepares honey sugar; the silkworm; the diplolepis gall produced upon the oak-tree; and the nut-gall (*Wu-pei-tsze*) produced upon the *Rhus semialata* and *Rhus succedanea*, are instances, amongst others, of that ingenious turning to account of things which is a strong habit of the utilitarian Chinese.

Insects, a large class, called in Chinese classifications, *Ch'ung*, and including frogs, mollusks, etc., are consumed by the Chinese as internal remedies.

Centipedes, scorpions, pediculi, and many other larval or imaginal forms of insects, are swallowed in wine as antidotal, derivative, and revulsive remedies. An anomalous creature, called the *Hia-ts'au-tung-ch'ung* ("in summer a plant, in winter an insect"), is a capital sample of a Chinese pet medicine. It is the *Hepialus* moth, with the *Cordyceps Sinensis* (fungus) growing parasitically upon it.

Blistering-flies are largely used in China. They are employed as diuretics, and to produce criminal abortion, so that their sale to ordinary persons is scarcely legal, and their use for such a purpose heavily punished by the Manchu Code of China. The *Myiabis cichorii* (*Pan-mau*) the Telini fly of India, is largely used in the

country, as in the composition of an eye-powder (*Yé-ming-sha*), commonly believed to be the dung of the bat. This insect is an excellent substitute for the *Cantharis* of European pharmacy. The *Cantharis erythrocephala*, a common European species, is met with in North China, but the *Cantharis vesicatoria* has not been met with.

Species of so-called *Epicauta* are met with in China, and are apparently called *Tsáu-mau*, or Zizyphus bug, from their resemblance to the fruit of that genus of so-called "dates." The genus *Epicauta*, known by their running more to legs and horns, is now generally put with *Lytta* and *Cantharis*.

Another kind of blistering-fly, new to European pharmacy, is the *Chú-kí*, or Ailanthus bug. It is called, literally, the "fowl of the *Ailanthus foetida*," from the noise which it makes in common with other cicadaceous insects of the class *Hemiptera*. It is also called *Hung-liang-tsze*, or "red lady-bug," a curious coincidence with the name of a common English insect, the ladybird. Several species or varieties of this insect are described or alluded to in the *Pun-ts'au-kang-muh*, or Chinese pharmacopœia. The genus called *Huechys*, from the Chinese name for blood, is met with in Java, as well as in North and South China and other places. The head, thorax, and legs are black; the prothorax is red; the eyes are very prominent; a large red bright spot on each side of the thorax above; the front pair of wings are dark brown, appearing nearly black when closed on the back of the insect; the hind pair of wings are pale with brown veins; and the belly of the creature is of a bright vermilion-red colour. Mr. Frederick Smith, of the British Museum, informs me that Burmeister places this insect, which I have called the red cicada on page 237 of my work on Chinese materia medica, in the order *Cicadina*, family *Stridulantia*. This same gentleman also informs me that Oliver (*Encycl. Méthod.*, v. 756) calls it the *Cicada sanguinolenta*, whilst Amyot and Serville describe it as the *Huechys sanguinea*. This latter name is redundant, as both the genus and species mean bloody. It would be better to call the Chinese species *Huechys vesicatoria*. One Chinese variety is called the "ash-coloured moth." The *chú-kí* is met with in Sechuen, Shansi, Honan, and Hupeh, and frequents the *Ailanthus*, *Broussonetia* (*Morus papyrifera*) and several other trees. They are met with in great quantities in autumn, when they make a grinding noise, and are collected by the country people, who sell them, fresh, to the druggists at a few pence per pound. They are capable of raising a blister, but are much less powerful than the *Mylabris cichorii*, with

which they are combined in the treatment of hydrophobia. The legs and wings are removed, and the bodies only used for medicinal purposes. They are recommended in the *Pun-ts'au*, as a remedy in barrenness, impotency, menstrual disorders, deficient lochia, lumbago, diseases of the eye, etc. The drug is curiously directed to be used as a vaginal suppository in female disorders. It is combined with olibanum, arsenic, sal ammoniac, and rice paste, as an application to struma of the neck. Their use in hydrophobia, along with the *Mylabris*, to produce strangury, is in accordance with Chinese theory that the bite of mad dog impregnates the person, who is not safe until the delivery of a foetal dog by way of the urinary passages. Hydrophobia is with them the climax of the period of gestation, and they promote parturition by giving the *Huechys* and the *Mylabris* internally; or, rather, they endeavour to induce abortion, as the drug is administered in wine at once in such quantities as to cause violent strangury. Along with the blood and other substances passed by the patient they profess to find a little dog. The Chinese doctors reason well enough that dog-bitten people die, and may be fairly treated after any extreme fashion. From this it may be gathered that the people die after the remedy even more promptly than after the bite alone. The drug can, therefore, be scarcely recommended for trial in such cases. It is creditable that few remedies are highly vaunted in Chinese medical works for a malady which is not common in China, where dogs are as plentiful and plaguy as in Constantinople. These blistering cicadas keep very badly, and, therefore, often disappoint the purchaser in China, where drugs are badly treated, like the patients.

Inefficacy of Immature Cantharides. (*Pharm. Journ.*, 3rd series, i. 158). Recent investigation shows that young cantharides do not possess the epispastic property, and it would seem that in medium-sized insects it is equally wanting. It is only the full-grown insects that will raise blisters. Cantharidine appears not to be developed until the complete maturity of the insect. In purchasing cantharides, therefore, those only should be chosen which have attained their full growth.

Newfoundland Cod-Liver Oil. (*Canad. Pharm. Journ.*, Oct. 1870, from *St. John's Telegraph*). The process of manufacturing the far-famed cod-liver oil at Portugal Cove, Newfoundland, is thus described:—The livers of the cod are sold by the fishermen to the manufacturer of the oil, at the rate of 24c. a gallon. On the average it requires 2½ gallons of liver to produce a gallon of oil. The livers are first carefully washed, and must be “cooked” at once, while

fresh. They are first put into a large tin boiler. This is plunged into a larger iron boiler filled with hot water, the water not being allowed to touch the livers, which are thus gently steamed till a quantity of oil is floating on the surface. This is dipped out, and filtered through blanketing first; then twice afterwards it is filtered through bags of moleskin. From the last filtration it comes out of a beautiful crystalline transparency, and without any unpleasant smell or taste. The oil is now poured into 60 gallon casks, and forwarded to the exporting merchant. The refuse is placed under screw presses, and the remainder of the oil extracted. This is not refined, but sold as common cod oil, and is used largely on railways for lubricating machinery. The cod-liver oil has gone up in price lately, owing to the immense demand for it in Europe, and now it is sold to the merchant at the rate of 130 cents a gallon. Last year 330 tons of it were exported, the value being 260 dols. per ton. Of the common cod oil, unrefined, 4,521 tons were exported, the value being 144 dols. per ton. So plentiful has been the catch of cod this year, that in one factory 2000 had been barrelled before the season was half through. The men who handle it get quite a liking for the oil. A little dog running about the premises laps it eagerly. The secret of making good cod-liver oil, lies in the application of the proper degree of heat; too much or too little will seriously injure the quality. Great attention to cleanliness is also necessary, the filtering bags requiring to be washed thoroughly every day, and the troughs scrubbed out with great care. The rancid oil that is often met with, is the produce of manufacturers who are careless about these matters. The best oil is made in the way above described; and all the pretences of quacks about refining it, and making it palatable, are, it is declared, mere moonshine, and either covers for adulteration, or such as deprive the oil of its medicinal properties. There is, no doubt, an enormous amount of adulteration practised by the retailers of cod-liver oil, but it is maintained that it is not done in Newfoundland. The greater part of the oil goes to London, and there it is "doctored." The writer in the St. John's paper, states that were a person with competent skill and capital to embark in the manufacture in Newfoundland on an extensive scale, and bottle the oil on the spot for the retailers, guarding it by a label and other securities, and guaranteeing a pure article of the best quality, his oil would speedily take the lead in the market.

Koumiss (*Lancet*, Nov. 26th, 1870). Koumiss is prepared from mare's milk, a beverage which the nomadic tribes of Bashkirs and Tartars drink in a state of fermentation. Dr. Victor Jagielski, late

a physician of the Prussian army, has been led to consider, in common with many physicians of Russia and Germany, that the popular belief of these people, which ascribes their exemption from consumption, bronchitis, and other diseases, to the almost exclusive use they make of koumiss, has a considerable foundation in fact. One of the first persons to direct attention to koumiss as a dietetic and therapeutical agent was Dr. Grieve, F.R.S.Ed., who held the post of physician to the Russian army. The best koumiss is manufactured in the government of Orenburg, especially on the large estates of Tstchoff, in the village of Kilimow, in the district of Beleber.

Koumiss institutions, supported by the Imperial Government of Russia, are now existing in Samara, under Dr. Postinkoff; in Odessa, under Dr. Levenson; and in Moscow, under Dr. Stahlberg. These establishments are preparing their koumiss from mare's milk; but within the last ten years institutions have been founded nearer to the centre of Europe, where koumiss is prepared from cow's milk, as in Warsaw, under the management of Dr. Przyslauski.

In St. Petersburg, and many other towns of European Russia, there are also institutions where koumiss is prepared from cow's milk by workmen brought expressly from Tartary, as well as in Charlottenberg, near Berlin, and in Ottenstein in Saxony.

Drs. Lersch, Schwepp, Wills, and Stahlberg give a favourable opinion as to its effects as a remedy. When a Russian physician advises his patient to take koumiss, the latter at once conceives the idea that he suffers from consumption; and, in fact, the belief in the power of koumiss in this disease is said to have taken such root, that patients use it of their own accord, without any appeal to medical advice.

Dr. Jagielski's object in publishing his pamphlet is to get the properties of this remedy tested in this country. The chemical changes set up in the preparation of koumiss arise out of the milk-sugar by its fermentation into alcohol, carbonic and lactic acids. The trial of this agent at the Brompton Consumption Hospital has been too limited to warrant any decided opinion as to its value; but if we may judge from the highly favourable opinions entertained of its virtues by various physicians abroad, it seems deserving of attention in this country.

Maclay, the Russian zoologist, who has travelled in Tartary, and is conversant with the use of koumiss in those districts where it is constantly employed, speaks of it as a dietetic and restorative agent of great value.

We should be glad to see an extended trial made of this agent at

some institution in England ; but the difficulty is that it is almost impossible to separate the effects arising from the improved diet which phthisical patients receive in hospital from those of remedial agents.

Variability in the Activity of Leaves. M. C. Cooke, M.A. (*Pharm. Journ.*, 3rd ser., vol. i., p. 861.) It may be asked with reason, is there any season or any condition which so influences the development of active principles in the leaves of plants as materially to affect their value as remedial agents? Undoubtedly there is, but not so much affecting cultivated as wild plants, because in the former the conditions are more uniform. Setting aside all question about periods of flowering or fruiting, or, in fact, of any period in the history of any individual plant, there seems to be one very important influence which is very much ignored, as affecting condition. This may be illustrated by reference to an example in which active principles are developed in a high degree, and in which the opportunity for testing is easily secured. The facts which seem to manifest themselves clearly and unmistakably in tobacco leaf, may be supposed to influence belladonna leaves, stramonium leaves, and even the leaves of other plants not in the least allied to them.

It is admitted that tobacco grown in a cold climate is much stronger than that grown in a mild one. In other words, active principles are more concentrated in leaves grown in cold climates, where the vegetation is less vigorous, than in warm ones. When the tobacco plant is forced on to a rapid growth, with a plentiful supply of moisture, the leaf is found to contain less of its characteristic principles than when stunted, starved, and but slowly developed.

Not only is this true of tobacco, but it is true also of other plants which have been tested. It is true of cultivated celery that the petioles and leaves are much more strongly flavoured when grown slowly than when grown rapidly, and under favourable conditions of soil and moisture. Except as they influence rapidity of growth, it is very doubtful whether the chemical constituents of a soil affect in any appreciable degree the active principles of leaves.

Take another example, although not, perhaps, quite so pertinent. In a very dry season, or when growing in very dry localities, the leaves of the common nettle are much more highly charged with their irritating poison than when grown rapidly, in a wet season, or in a moist locality.

From these and similar instances, therefore, we are led to the conclusion that rapid growth, with a plentiful supply of moisture, is

least favourable to the development of those properties in leaves which are of value in medicine. Whether this principle holds good with glandular plants, secreting essential oil, such as the *Labiatae*, we are not prepared to affirm from actual experience. The inference is, that leaves grown in a dry season would, *ceteris paribus*, be more active than leaves grown in a wet one; that plants grown in a damp situation, or a rich, stimulating soil, would be milder than those grown under less favourable conditions. In fact, we have found the leaf of *Arum maculatum* to vary considerably in its biting acrid properties in proportion to its development. Leaves from large rapidly growing plants in moist situations are by no means so acrid as the small leaves of stunted plants growing on dry banks. This is an experiment which any one can perform for himself during a country stroll.

It would be of interest to ascertain by careful analysis what is the difference in the proportions of the constituents of such leaves as belladonna and stramonium, grown under the two conditions of vigorous and retarded vegetation. The very rough test applied to the leaves of arum, and the inexact one applied to tobacco, indicate strongly enough that there must be a very appreciable difference; but this is in itself insufficient, it should be determined what is the difference; and we have no doubt it will be sufficient to account for much of the variability in the action of leaves.

A less important circumstance, but one which should not be lost sight of in this connection, is the difference between fully matured and young leaves from the same plant. There can be no doubt that there is a difference, but the proportion of young leaves, weight for weight, to mature leaves will not be great when dried, because the larger percentage of water in young leaves will reduce the disproportion, as well as the excess of mature leaves which will be collected from a full grown plant, over immatured ones.

From these suggestions it seems to us that the pharmacologist may collect some of the causes that influence the variability in activity of leaves gathered and dried indiscriminately. It is quite possible that in some instances foliaceous drugs have been condemned for their uncertainty, when the fault has really been traceable to an unsystematic and indiscriminate mode of collection. The results of recent experiments on the influence of climate, soil, moisture, and other external circumstances, upon the development of active principles and aroma in tobacco leaves, incline us to the opinion that, not only in that instance, but in many others, the circumstances and their influences have been too much forgotten or ignored.

On the Metamorphoses and Migrations of the Proximate Principles in Herbaceous Vegetables. P. P. Deherain. (*Journ. Pharm.* (4) xiii., 16, and *Journ. Chem. Soc.*, ix., 577, 1871.) The author of this memoir states that the proximate principles of vegetables migrate from the older to the more newly formed leaves, and that this migration is associated with a transformation of glucose into cane-sugar, whilst when the seed is formed, the cane-sugar is converted into starch and the albumen into gluten—both insoluble. In this way the conversion of soluble into insoluble principles, and the accumulation of substances in the seed is accounted for; and it is illustrated by the following experiment:—If a porous vessel containing distilled water be placed in another vessel containing a solution of cupric sulphate, the salt penetrates by diffusion into the inner vessel. If then a few drops of baryta-water be added to the inner vessel, the salt is precipitated, the equilibrium is disturbed, and a new portion of cupric sulphate diffuses into the inner vessel. The salt may be again precipitated by baryta-water, and the operations repeated till eventually the whole of the cupric sulphate will have passed into the porous vessel and there have been precipitated.

Analysis of the Berries of *Berberis vulgaris*. By E. Lenssen. (*Deutsch. Chem. Gesells.*, iii. 966.)

The following is the analysis of the ripe berries :—

Grape-sugar	3.57
Free acid	6.62
Vegetable albumen	0.51
Soluble precipitates	1.37
Ashes	0.96
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Total of matters soluble in water	13.035
Stones	8.04
Skin and cellulose	2.56
Pectose	1.69
Ashes of all insoluble matters	0.86
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Percentages of insolubles	12.290
Watery juice	74.675
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	100.000

The free acid proved to be chiefly hydric malate. Neither citric, nor tartaric, nor acetic acid could be detected. The circumstance, that these berries contain only malic acid, and this in rather good quantity, makes it advisable to employ them for the production of malic acid.

Opium Trade and Cultivation in China. J. R. Jackson, A.L.S. (*Pharm. Journ.*, 3rd series, i., 782):—It is interesting to note to what extent the cultivation of the poppy for the production of opium varies in different districts of China. From time to time its growth has been forbidden by proclamations from the emperor, the penalty for growing it being death. Small quantities have been nevertheless constantly grown: for instance, ten years ago all the opium that was produced in Szechuen was grown in small patches of gardens, ostensibly for the amusement of the owners, but specially for the value of the crop. It is a fact that though the proclamation is still in effect, the executive authorities have found it necessary to take no official cognizance of the existence of the plants; and it is significant of the impotence or the venality of the Chinese authorities, or the discord between the imperial and provincial governments, that the white poppy fields may be seen on the most conspicuous places on the great river route, while the cultivation of it is nominally punishable with death. That the cultivation of opium in China is actually increasing cannot be denied, though it is still, in some districts, planted with great secrecy; small patches of land under its cultivation being hidden by fields of tall millet, and when so situated are quite safe from any interference from revenue officers.

Notwithstanding the increase in the production of Chinese opium, and the consequent decrease during the past year or two of the importation into China of the Indian drug, the question still remains whether the native will drive the Indian produce out of the market, or depress the latter so much as to seriously affect its importation and price. In point of strength or flavour the Indian is far superior to the Chinese, the latter averaging 40 per cent. less in price. It is its cheapness that is one of its chief recommendations in the Chinese market, and, being purchased at such a reduced price, it is often mixed with the Indian drug.

With regard to the conditions under which Indian opium now enters the Chinese market, the following notes contained in a recent report on the subject will better explain them than any words of our own:—

“Malwa opium is cultivated by native growers in the province of Malwa and the adjacent and central provinces of India,—the land upon which the crops are grown paying to the Government the customary ground-rent. The farmers, upon gathering in their crops, offer the juice of the poppy daily upon the nearest country markets, and it is there purchased by other natives (who may be denomi-

nated packers), who, in their turn, pack the drug in balls, and thus prepare it for transmission to Bombay. These packers then sell the opium, thus prepared, to other native merchants, who purchase it especially for sale upon the market of Bombay, where exporting and foreign merchants buy it for shipment to China, etc. The importing Bombay merchant, before attempting to take the drug to Bombay from the hand of the packer, has first to procure a pass from the Government treasury, costing 600 rupees per chest, which passes free the opium from further taxation *in transitu*, certifying that the drug has paid its duty. Upon reaching the market in Bombay, as aforesaid, it is purchased by the exporting merchants, who, before operating, naturally base their calculations on the China demand and quotations; and thus the market in Bombay, and necessarily throughout the producing districts, is governed by the market of China. The quantity placed under cultivation by the growers is also almost entirely dependent upon the demand, both of the present as well as of the preceding season; and thus the crops usually range from 35,000 to 50,000 chests per annum. No opium is allowed by the English Government to be reimported into India. It may be as well here to state that, during the past three or four years, the demand for China having decreased, the cultivation in India has been lessened in like degree.

"Of the Bengal drug there are two descriptions,—one, called Patna (produced in the province of Behar), and the other Benares, from the province of that name, where it is grown. Both descriptions are cultivated entirely by the Government itself, which employs men for the special purpose of cultivating the poppy, collecting the juice, inspecting and packing it into balls. The drug is supposed to cost the Government, laid down in Calcutta, 400 rupees per chest. On arrival of the drug into the Government godowns at Calcutta, it is sold by public auction, in lots of five chests, to the highest bidder. On the fall of the hammer, the buyer has always the option of there and then securing as many succeeding lots as he wishes at the same rate as the lot he has just bought. The purchaser of any parcels has to pay, on the fall of the hammer, bargain money at the rate of Rs. 50-100 per chest, and the balance of purchase money within a fortnight. It is not compulsory, however, to take immediate delivery of the opium, as the Government allow it to remain, free of warehouse charge, for an indefinite period.

"These auctions take place once every month, a limit of 400 rupees per chest being placed on the drug; therefore, all it

realizes over and above this price goes towards increasing the revenue, and is a profit to the Government. The crop is apportioned in equal quantities to each month for public competition, and its extent is, in a great measure, regulated by the demand, as in the case of Malwa. No private individuals are allowed to store opium in these godowns; all so found is looked upon as smuggled, and confiscated. When a buyer wishes to export his purchases, they are shipped for him by the Government agent, and delivery cannot be taken in Calcutta.

"About fifty years ago, when Patna opium had been introduced and had made some way in Szechuen and the neighbouring provinces, it fetched double its weight in silver, and the people smoked it cut in slices and rolled up in paper like a cigar. At the present time there seems little doubt but that its consumption is increasing rapidly, more especially among the labouring classes. It is said that already eight men out of every ten smoke it, and quite one-half of the women. Irrespective of the moral bearings of the subject, there can be no doubt that if a general and open system of poppy cultivation were allowed in China, it would become a highly remunerative branch of agriculture."

Opium Trade in China. P. L. Simmonds (*Pharm. Journ.*, 3rd series, i. 361):—Few are, perhaps, aware of the enormous trade still carried on in opium from India to China; and what is, probably, even less generally known, is that the poppy is largely cultivated in China itself, and that the native drug is beginning to replace much of the Malwa opium. Mr. R. Fortune saw the poppy extensively grown in China for the purpose of inspissating the juice, but was able to form no estimate of the quantity actually grown. We have, however, confirmatory recent evidence of the extension of the culture and production in China. More than thirty years ago it was stated in the *Chinese Repository*, on the testimony of the counsellor Choo Tsun, that in his native province, Yunnan, the poppy was cultivated all over the hills and open country, and that the quantity of opium annually produced there could not be less than several thousand chests. Indian opium now brings in an average annual gross revenue to the Indian Government of about £8,200,000.

The value of the opium shipped from India to China in the last ten years is thus given in the official statistics; from which it will be seen that the average annual import has not varied very greatly in the two quinquennial periods, although there are alternate high and low years, and the price fluctuates much:—

	£		£
1860	9,054,394	1865	9,911,804
1861	10,184,713	1866	11,122,746
1862	10,553,912	1867	10,431,703
1863	12,494,128	1868	12,309,915
1864	10,756,093	1869	10,695,654
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Total	53,043,240	Total	54,471,822
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Average	£10,608,648	Average	£10,894,364

In 1856, the consumption of Indian opium in China was about 82,000 chests of 140 lb. each, but this was exceptionally large.

In his report upon the trade of Tien-tsin for 1866, our consul drew attention to the fact that the increase in the importation of opium in that and the previous year had been immediately preceded by an imperial edict, issued on the 28th April, 1865, which prohibited the cultivation of the poppy throughout the empire. He stated that though, at first, the operation of this edict was beneficial to the trade in foreign opium, the poppy was still grown extensively, and the prohibition would prove ineffectual. That such has hitherto been the result is proved by the fact of another edict having been issued on the 31st January, 1869, redirecting all viceroys and governors to cause proclamations to be issued, forbidding altogether the cultivation of the poppy, which is stated to have been introduced from Kan-suh into Shen-si and Shan-si, and afterwards grown in the provinces of Kiang-su, Honan, and Shan-tung. The ground of objection to the poppy, and even to potato culture, stated in the edicts, is that they withdraw land from the cultivation of rice and grain.

There is little doubt that the competition of native-grown opium has had much to do with the declining price of the foreign-grown since 1866, and that at the same time the increased production of the native has lessened the importation of Indian opium.

At Tien-tsin, since 1866, it is certain that a yearly diminishing importation has accompanied a yearly falling price, plainly indicating a decreasing demand for foreign opium. There is no evidence, however, according to Mr. Consul Mongan, of the decrease of opium smoking, but rather of its increase; and therefore it may fairly be inferred that the quantity of native opium has so much increased, or its quality so much improved of late, as to have shut out a considerable amount of the Indian drug. This inference, too, is much strengthened by the reference which the late edict makes to the spread of poppy culture over northern China.

In addition to the provinces enumerated in the edict, there is also ample evidence of extensive poppy cultivation in other parts of the Chinese empire. It seems to have been carried on for many years in the extreme south-west, in the province of Yunnan, the largest portion of which has thrown off its allegiance, and is now a practically independent kingdom.

Sze-chuen has also been for many years a great poppy province, and the drug produced there very perceptibly affects the market at Hankow. When Lord Elgin visited that city in 1858, he stated (Blue Book, 1859, page 443) that he saw there "shops where native opium was openly advertised for sale." Mr. T. T. Cooper, in some notes on his travels towards India through Central China, speaking of Sze-chuen, says, "In spring the country was white with the flower of the opium poppy, now one of the staple productions of the province;" and Mr. A. Wylie, the well-known Sinologue, who has travelled lately in the same province, says in a letter, "One fact I can vouch for, and that is the widespread use of the drug, and consequent degradation of the people. It was pitiable to see the victims of this practice coming to us to ask for relief, and desiring to be cured, and such were by no means confined to the lower classes. I believe the practice in Sze-chuen, as elsewhere, is very widespread among the literary and governing class. From all the information we could gather, it commenced in this province within twenty or thirty years past. In the 'Statistical Account of Sze-chuen,' published in 1817, which gives a detailed list of the productions of the province, the poppy is not named. I do not remember seeing any foreign, though it is sold there, but at every market the farmers bringing in their little lumps of native production were always to be met with. As far as I could learn, the price ranged from 140 to 250 cash the tael weight."

Another vast region, not mentioned in the edict of 1869, in which poppy culture has been spreading rapidly within the last few years, is Eastern Mongolia and Central and Northern Manchuria, the drug thence brought down to the coast competing with Indian opium in the Newchwang market. Thus, in the provinces of Yunnan, Sze-chuen, Shen-si, Kansuh, Shan-si, Honan, Shan-tung and Kiang-su as well as in Manchuria and Mongolia, native opium is produced; and that its consumption by the Chinese is lessening the demand for the Indian drug, would seem to be indicated by the fact that in 1868 the total importation of the latter was less than it had been in 1867 by 4789 chests, representing a value, at the average ruling rate, of nearly two millions sterling.

These figures are given in a letter that was published in the *North China Daily News* of the 22nd February, 1869.

Chinese Native Opium. (*Pharm. Journ.*, 3rd series, i., 604). In confirmation of the foregoing remarks on the extensive production and consumption of native opium in China, the following details may be given. They are from a detailed report of an inland journey made by Mr. Moss at the expense of the Hongkong Chamber of Commerce, presented to the Chamber in November, 1870. The information is therefore recent, and may also be considered authentic. It is not likely to see the light in the official British consular reports for some time to come. Although all the foreign opium which is smoked in the country pierced by the West River is smuggled, and there is no means for estimating, even approximately, the quantity actually imported, it is impossible to arrive at any other conclusion than that in proportion to the consumption of the native drug it is trifling and unimportant. In the opium shops of Wuchaupu, and in all the towns to the westward, the foreign drug is rarely asked for, and that from Yunnan is exclusively smoked. What little foreign is used is Bengal, brought ball by ball up the river to Wuchan, and overland to the towns beyond from Vakpoi. Its price in the first week in July at the former city was 5 dollars per catty, or about 15 dollars per ball. At Tsunchaupu, in June, the price was 5.10 dollars per catty, and at Hwangchau a little over 5 dollars, or about 600 dollars per chest. The prepared drug was to be obtained at from 4 mace 8 candareens to 5 mace 5 candareens per tael weight, the average being about 5 mace per tael. Yunnan opium, on the other hand, was being retailed at from 3 mace 6 candareens to 4 mace per tael weight, according to its purity and quality. A common kind was purchasable at 3 mace. The raw drug is in round flat casks, about 6 inches in diameter, by about 2 inches thick, weighing from 12 to 20 taels, and more or less adulterated with gritty, earthy matter. It was sold at from 18 to 20 taels per 100 taels weight; and old drug in the first week of July was selling at Wuchaupu at 12½ taels. These rates were considered high. In the previous year the drug had been as low as 15 taels per 100 taels weight. From 15 to 20 taels per 100 taels weight is equivalent to 335 to 445 dollars per picul (133½ lbs.).

Although it is smuggled into the country, and the very heavy exactions it is subjected to are evaded, the price of the Indian production, as compared with that of the native-grown commodity, is so high as practically to exclude it from consumption; and inquiry

leads to the conclusion that, unless the price be reduced to approach closely to that of the latter, its superior quality, stronger flavour, and greater narcotic power will fail to obtain for it an increased demand. It does not appear that foreign opium has ever been smoked in these regions by the bulk of the people; and if the statements of old smokers and of shopkeepers are to be credited,—and there seems to be no reason for discrediting them,—it cannot but be believed that for at least two generations native-grown opium only, from the province of Yunnan, has been almost solely consumed. There is nothing to show that its issue has increased; on the contrary, it is obvious that the opposite must have been the case from the destruction of large cities, the diminution of the population generally over the country, consequent on the Taeping rebellion, and from the state of warfare which has existed during the past fifteen years and longer in the Yunnan province, and which is reported to have devastated it. Considering the proximity of this portion of the empire to Canton, it is a significant fact that foreign opium has not entered into general use; and there can be no doubt that in the habituated taste of the native smokers the foreign drug has had to contend against an influence nearly, if not quite, as powerful as its own high cost.

The imputations which have been directed against the foreign trade in this article, in so far as it has affected this part of China, are disproved most convincingly by a journey up the West River. In no city, town or market village he enters will the traveller find the foreign opium consumed by the inhabitants; and in Kwangse, in only a few shops of the largest cities, will he succeed in meeting with it at all. The further he pushes inquiry, the more firmly will he entertain the conviction that opium-smoking has been a habit common over the country from a period anterior to the present century, and that the supply has been met by native production. To impute its introduction into this portion of the country to the foreign opium trade is to assert what will appear to be positively contradicted by facts.

Opium Cultivation in Würtemberg. (*Pharm. Journ.*, 3rd series, i., 302, from *Gewerb. aus Würtemberg*.) Herr Jobst states in his report the results of this year, as follow:—

Though large quantities of poppies were sown last spring, the crop rarely did well in consequence of the continued dry weather. This alone put an end to any prospect of considerable development in opium cultivation for the present year, and the scarcity of labourers at the time of gathering was for a time a further hin-

drance. Subsequently, when the influence of the war had driven many to this work, the best time for collection was past, and the poppies ripened too quickly, owing to the great heat.

On the contrary, the price of the new Asiatic opium admitted of the best Würtemberg opium fetching as much as 34s. per pound. At this price the earnings of a labourer would amount to 2s. 6d. a day, which is good, considering that old men, women, and children could be employed for the purpose.

The opium of this year is much superior to that previously grown. The amount of morphia it contains is 12 per cent., even in samples that are somewhat moist.

Opium Cultivation in Australia. J. S. Ward (*Pharm. Journ.*, 3rd series, i., 543.) The large sums paid as duty on all opium imported into Australia, has caused the experiment of growing poppies for the production of opium to be tried for two or three years in different parts of the colony of Victoria with good success. The product has been of a tolerably uniform quality, and the samples have yielded variable quantities of morphia.

The author received a sample of the opium, together with the following remarks from Mr. Francis, a Melbourne pharmacist :*

"The poppies, from which the present sample was extracted, were grown in Gipps' Land, a vast tract of country forming the south-east portion of the colony of Victoria. The land taken up was one quarter acre. The plants were placed nine inches apart, in rows two feet six inches from each other. They were planted in July, the opium was extracted in the December following. Each plant attained a height of from five to six feet, the number of capsules on each averaging ten. The mode of gathering was as follows:—The capsules were nicked in the afternoon of the day by one person, another following immediately after, gathering the drops as they fell. The liquor, being very thick, was then placed in tin dishes and exposed to the sun, till a proper consistence was attained. The gross yield of opium from the quarter acre, of the consistence of the sample sent, was 14 lbs. weight. You will notice that the mode of collecting is somewhat different to that spoken of by Pereira, and it was found better to collect towards evening than in the morning, on account of the heavy morning dews.

"I have seen other samples of opium prepared and grown in the colony, but got up more closely to resemble the ordinary article of commerce; they compared very unfavourably with the one sent.

* Read at the Evening Meeting of the Pharmaceutical Society, Jan. 4, 1871.

"I might perhaps mention that I paid 52s. per lb. for the opium; but I bought it rather on account of its novelty than for any other reason. I have not yet used it in business, nor tested it, so as to arrive at any conclusions as to its commercial value.

"All imported opium is subject to a duty of 10s. per lb."

This opium, when first received, was of a light brown colour, and in appearance like a well-made hard extract, but on keeping became, like other opiums, much harder and darker; when quite dry, it breaks with a smooth regular fracture. These characters are explained by its being a pure dried juice.

Its odour, which is very fine and marked, is similar to that of Smyrna opium, but scarcely so powerful. Cold water takes up 46 per cent. of soluble matter. A tincture made according to Pharmacopœia is of a very light colour, being no darker than the tincture of myrrh.

The most important character of this sample is its richness in morphia. On submitting it to quantitative analysis I obtained the following result:—

Morphia	9 per cent.
Narcotine	4 „ „
Meconic acid	6 „ „

I have not examined it for any other alkaloids, not having a sufficient quantity of the sample to work on. I can only find one report of an analysis of this opium, namely, by Mr. Bosistoe, of Richmond, who, in a paper read before the Royal Society at Melbourne, stated that it contained 10 per cent. of morphia and 3 of narcotine.

By these characters, it will be seen that Gipps' Land opium will compare favourably with the best Smyrna; and it cannot, I think, be doubted that its more extensive cultivation in this district would prove a source of large increase to the revenue of the colony, and, consequently of great advantage to its inhabitants, while, at the same time, it will supply us with another new and important source of this valuable drug.

Opium Cultivation in America. G. W. Kennedy. (*Amer. Journ. of Pharm.*, xliii., 6.) In a letter to the editor of the *American Journal of Pharmacy*, G. W. Kennedy informs him that he has procured poppy seed from abroad, and supplied it to a friend in Illinois, with a view of trying an experiment in opium culture. The seeds were planted in rows two and a half feet apart, in well-manured, rather dry soil, and in moist soil. The seed sown in the wet soil failed. The plants

received good garden culture, and attained a height of three feet. After the petals had fallen, and the capsule attained some size, horizontal incisions were made around the capsules in the afternoon, and the exudation removed in the morning and dried in the sun. Some of the capsules failed to yield any juice, owing to the wound being too deep, and the juice passing into the cavity of the capsule. The yield of opium was small, many of the plants being imperfect. Mr. Kennedy made a partial examination of it, and detected meconic acid; and when treated by Mohr's process, with subsequent crystallisation of the precipitate from alcohol, it yielded 8.75 per cent. of morphia crystals, which gave the proper reactions with nitric acid and chloride of iron.

Mr. Kennedy hopes to make a more successful experiment next year.

Poppy Farming in Queensland. (*Pharm. Journ.*, 3rd series, i., 972.) A successful attempt at poppy farming is reported from Queensland. A specimen of opium, grown by Mr. Tatnel, in the Toowoomba district, last season, has been exhibited, consisting of five cakes weighing one pound each, which was part of the produce of a quarter of an acre of poppies. The quality was so superior that the whole exhibit was purchased by a medical gentleman in Toowoomba, at £3 10s. per pound. The net proceeds of the crop will amount to £28 or £30.

We extract the following particulars as to the cultivation, from the *Brisbane Courier* :—

“The first advice given by Mr. Tatnel, is to be exceedingly careful in selecting the seed (*Papaver somniferum*). This appears to be the main point, as on this hinges ultimate success. There are some kinds of poppies very similar, in many respects, to the true Turkey, but which are not adapted to this climate. The East Indian seeds germinate quite as freely, but the Turkish plant will blossom nearly three weeks before it. The former, also, has but one capsule, and upon incising it, only a small quantity of gum will exude, and subsequent incisions will not produce further discharges.

“The white poppy plant is also very similar to the East Indian, but equally unprolific. Opium can be obtained in greater or less quantity from all the poppy species, but the main object is to select those sorts which will yield the greatest profit to the grower.

“The poppy must have rich ground, either naturally so, or through the application of manure. Land which has been worked previously for a root crop, and brought into fine tilth by the cultivator and horse-hoe, is better than new land for this plant, for as it has a tap-root, any interference with the downward course of the latter will

prevent the flow of opium. It ought to be sown in drills, from eighteen inches to two feet apart. The objections to the broadcast system of sowing are:—First, That when making incisions it is very difficult to distinguish between those plants which are cut, and those uncut. Secondly, When gathering it is impossible to avoid coming in contact with the liquid gum, thus causing a great waste. Sow the seed in the drills in the first instance, as transplanting is so difficult and uncertain with such delicately tap-rooted plants. The tap-root resembles a piece of cotton thread, and it is almost impossible to remove it without injury. The time for sowing in this district is from the middle of May to the end of June, but it would be well to get as much of the sowing completed as soon as possible before the end of May. Frosts will not affect the poppy plant, nor will watering it too freely benefit them; warm dry weather being the most favourable season for a large return of gum. The plant may be made to grow very rank, through the application of liquid manure, but the extra quantity of produce will prove a thin milky substance, which, when dry, is not worth the trouble of collecting. The system of gathering is very simple, and may be performed by careful children. The yield per acre has been estimated at from 35 to 40 lbs., and the price for the raw and unadulterated produce would range from about £3 to £3 10s. per lb.”

The following practically explains the gathering process:—

“The time to cut the capsule is from two to three days after the flower-leaves have fallen off, when it will be about the size of a walnut. There are two methods of doing this, which have been found to answer; the first is by making several longitudinal cuts from the base to the crown; the second, to make two horizontal incisions, one above the other, half round the capsule, the cuts to be made with a sharp knife, and made in such a way that they should have an upward slope, by which means—should the knife penetrate through the shell of the capsule—inward bleeding and consequent loss of gum will be prevented.

“The latter plan was found to be the best. The knife used should be one having two blades one-sixth of an inch apart, with a guard upon the blades to prevent them cutting too deeply. The cutting process should take place during the evening, as the gum exudes in greater quantities during the cool hours of the night than in the day, and will be found in a fit state to gather when the sun has been on it for an hour or two in the morning.

“Those who are to collect the gum should be furnished with a blunt knife, with which to scrape the heads, and have a sharp edged

tin fastened by a strap round the waist in which to collect the opium. The tin must have a sharp edge, as the opium adheres very firmly to the knife, from which some force is required to remove it.

"Towards the evening, hands can be set to work to cut the heads a second time, making the cuts on that side of the capsule left uncut the previous day. The process as described, may be continued each day until the heads cease to yield sufficient gum to make it payable.

"In conclusion, the opium collected should be dried in shallow plates to a proper consistency to work into flat cakes, weighing about half a pound each, and let this be done as early as possible, for it soon becomes musty if not properly dried. When it is worked into the required shape, cover it with poppy leaves and keep it in a dry place.

"The plant may be grown with profitable results for capsules alone, and with very little risk to the cultivators. The capsules are worth 35s. per thousand in Melbourne, and the yield per acre is from thirty-five to forty thousand, according to season.

"We understand that, independently of the yield of opium, Mr. Tatnel has also obtained a fair crop of seed, a portion of which he will no doubt distribute among his friends and neighbours before the planting-season, which is now rapidly approaching."

Poppy Culture in North America. (*Pharm. Journ.*, 3rd series, i., 148.) In order to supply the requirements of American pharmacy, the cultivation of the poppy has been commenced in various parts of North America. According to the *Journal de Pharmacie d'Anvers*, the Californian agriculturalists have tried it upon a large scale, and as they have been assisted by the extensive experience of the Chinese, great numbers of whom are now settled in the state, the experiment has succeeded very well.

There is much in this enterprise to tempt the farmer. It is well known that the poppy will grow in almost every kind of soil, and in nearly all climates, and that it needs very little skill for its cultivation. The amount of labour, too, required for collecting the opium is small. No process can be more simple than to split open the poppy head when it is mature, and to extract from it the milky juice; this is rolled into a ball by means of a spatula with as much ease as a dairymaid forms a roll of butter. Twenty-four hours afterwards, the opium is ready for sale.

The poppy is also cultivated in Louisiana. Last spring a farmer planted seven acres with it there, and he hopes to collect fifty pounds of opium per acre. This would be an excellent return; but much depends, as in the case of cotton, upon the rapidity with which the gathering is done.

The *Journal of Applied Chemistry* in a recent number, states that Mr. C. Wilson of Monkton, Vermont, sowed in the spring of 1868, rather more than six and a quarter acres with opium poppy seed. The yield from the gathered juice of the poppy heads, or capsules, was 140 pounds, which, when dried, became marketable opium. For this the grower obtained prices ranging from eight to ten dollars per pound, from druggists and physicians in New England. The opium furnished 6.25 per cent. of morphine. It is stated by Professor Proctor, that with greater care in obtaining the pure juice of the capsules, the opium might be made to yield 10 per cent of morphia. The proportion of this alkaloid which the best Turkey opium is capable of affording, varies from 9 to 14 per cent.

Contributions to the Knowledge of *Argemone Mexicana*. (*Arch. Pharm.*, 2, cxlv., 51; and *Journ. Chem. Soc.*, ix., 154, 1871.) The first section of this paper contains an interesting historical account of the plant and its migration, by Flückiger, who also objects to some statements of Charbonnier on the purgative action of the oil obtained from the seeds of the *Argemone*. Flückiger did not find its action as a purgative so powerful as that of castor oil.

The oil was examined for volatile acids, by O. Frölich. 3½ lbs. of oil were saponified with soda-ley; the solid soap was salted out, and the aqueous liquid treated with sulphuric acid, and distilled. The distillate was neutralised with soda, evaporated down, decomposed by sulphuric acid, and repeatedly shaken up with ether. The ethereal solution gave about one gram of a liquid boiling above 100°. This went over between 140° and 240°. About ½ gram of a liquid boiling between 160° and 190° was obtained from it. It gave, on analysis, 55.8 per cent. C., and 9.4 per cent. H. A mixture of butyric and valeric acids would give numbers approaching these. The portion coming over above 190° became solid on cooling. It showed the melting point (120°), and several other properties of benzoic acid, but there was not enough for analysis. The aqueous liquid, exhausted with ether, appeared to contain acetic acid.

The Ochro and the Musk Mallow. John R. Jackson, A.L.S. (*Pharm. Journ.*, 3rd series, i., 965.) Perhaps there is no one family of plants having so many species, with such a decided characteristic property running through the whole, as the *Malvaceæ*. Almost all are mucilaginous; and though none of them are now officinal in this country, the marsh mallow (*Althæa officinalis*, L.) and the common mallow (*Malva sylvestris*, L.) are sometimes used by the peasantry in rural districts, a decoction of the leaves of the first being applied for fomentations, and the mucilage with which

both this and the common mallow abound being employed as a soothing or softening drink in coughs and bronchial affections. It is, however, chiefly in France that the roots are used to produce a demulcent drink known there as *guimauve*.

In tropical or temperate regions, where the species of this order are found most abundantly, the mucilage and seeds of the several species are used by the natives for various medicinal purposes. Two of the most interesting plants are the ochro (*Hibiscus esculentus*, L.) and the musk mallow (*H. Abelmoschus*, L.): the first interesting on account of its esculent and medicinal properties and uses, and the second principally on account of its seeds being used, to a certain extent, as a substitute for animal musk.

The ochro, or edible hibiscus, is an annual herbaceous plant, with hairy stems and alternate cordate leaves, strongly toothed, and from three to five-lobed. The petals are pale yellow, with a deep crimson base. The capsules or fruits appear to vary much in size according to the country where they are produced. Those we have seen from the East Indies are usually from four to six inches in length, and about one inch in diameter at the base, tapering upwards to the apex; while those grown in Venezuela and some other parts of South America, as well as those from South Africa, are not more than two or two and a half inches long, and one and a half inches diameter across the centre. They are marked with from five to eight ridges, running longitudinally from the base upwards, and corresponding with the number of cells, each ridge forming a valve, and partially dehiscing when the fruit is ripe and dry: the small round seeds also becoming loose and shaking in the capsule like a rattle. The plant is a native of the West Indies, but is cultivated extensively in all tropical countries, as well as in the south of France, principally for the sake of its fruit. This is gathered before it is fully ripe, and is used as a vegetable, but chiefly for imparting a mucilaginous thickening to soups; it is also used when very young for pickling, like capers. The plant is officinal in India, being considered a valuable emollient and demulcent; the capsules are employed in a decoction, and the Indian Pharmacopœia gives the following instructions for its preparation:—

“Take of the fresh immature capsules, sliced transversely, three ounces; water, a pint and a half. Boil to a pint and strain; sweeten to taste.

“Dose.—From three to six ounces, or *ad libitum*, as an ordinary drink.”

The inhalation of the vapour of the hot decoction has been found

very serviceable in allaying cough, hoarseness, irritation of the glottis, and other affections of the throat and fauces. The dried capsules may be employed when they are not procurable in a fresh state.

According to the testimony of Dr. Gibson and others, the fresh capsules bruised form an efficient emollient poultice.

The seeds are used in native practice in the preparation of a demulcent drink, corresponding to our use of barley, and the leaves are used for poultices.

The musk mallow (*H. Abelsonschus*, L., = *Abelsonschus moschatus*, Mærch.) is also an annual herbaceous plant, with irregularly-toothed hastate leaves. The flowers, like those of the former species, are yellow, with a crimson base, and are succeeded by an oblong lanceolate, hairy capsule. The plant is a native of the East Indies, but has become naturalized in the West, and is also cultivated in most tropical countries. Both in the East and West Indies, the bruised seeds are used internally and externally as a supposed remedy for snake bites. They have a very strong, musky odour, and possess cordial and stomachic properties; and the Arabs mix them with their coffee to give it a perfume. They are also used by perfumers in this country, chiefly, we believe, in the form of powder for sachets, being imported from the West Indies for this purpose. Both of the above-named plants abound in a strong silky fibre.

Ylang-ylang. E. Rimmel. (*Pharm. Journ.*, 3rd series, i., 598.) The essence of Ihlång-ihlång is distilled from the flowers of the *Unona odoratissima*, a large tree which grows in the Philippine Islands, the Straits of Malacca, and the Indian Archipelago. *Ihlång-ihlång* (improperly spelt Ylang-ylang by the Spanish residents), is the native *Tagal* name this tree bears in the Philippine Islands. The Malays call it *Kanonga*, and it is found described under that name in the works of Rumphius, an eminent botanist of the seventeenth century, who says that the smell of the flowers is so powerful that it scents the air for miles around. The flowers are flosculent and drooping, and of a greenish-yellow colour. They were first distilled by a chemist at Manilla, and yielded an essence of an exquisite odour, somewhat partaking of the jasmine and lilac, but still having a flavour *sui generis*. This essence is now largely manufactured and used by the leading perfumers, either pure or in compounds. It is made principally at Manilla and Singapore. The former is the finest, and costs when pure about £2 per ounce.

Rhatany from Para. Dr. F. Flückiger. (*Pharm. Journ.*, 3rd series, i., 84). Since the end of last century the roots of *Krameria*

triandra, a native of Peru, have been known in medicine under the name rhatany. At a later period, about 1852, in Germany, it was found to be mixed with the roots of *Krameria Ixina*, a native of the northern parts of Southern America and of the Antilles. It has been shown by Hanbury (1865) and by Triana, that this plant yields the rhatany of Savanilla or New Granada. This kind is nowhere properly officinal, but it had, nevertheless, recently, and for a time, almost displaced the Peruvian root; until later this has again become abundant.

A third variety of rhatany root was described by Berg, in 1865, as of Brazilian origin, and coming from Para. He obtained it from Gehe & Co., of Dresden. The author also obtained this drug from the same source, so that he is able, from personal observation, to confirm Berg's description.

The author has also obtained the same root lately from Étienne Roques & Co., in Paris, and was assured it came direct from Para. It is in pieces 16 to 20 inches long, and $\frac{1}{8}$ to $\frac{1}{4}$ of an inch diameter, inclusive of the bark. They are all of a dull, uniform, dark brownish or greyish colour, like the sample obtained from Gehe & Co. This colour in itself is not striking, but if the three varieties of rhatany are compared together, there is a distinctly recognisable difference between them. The Peruvian or Payta rhatany is red. the Savanilla is violet, and the Para root is greyish-brown. The two latter are most alike superficially, and this is probably due to the preponderance of tannin that colours sulphate of iron bluish-black.

The author sums up his remarks as follows:—

1. There are, at present, in commerce, three different kinds of rhatany, which are best named after their principal ports of exportation,—Payta, Savanilla, and Para.
2. The first two kinds are described according to origin and characters in every modern work on pharmacognosy.
3. The Para root was first described by Berg, as "*radix ratanhiaë brasiliensis*;" by Cotton as "rhatany of the Antilles."
4. Its colour varies between dark grey and brown; the extremes of this colour were regarded by Cotton as black and brown varieties.
5. This colour is very distinct from that of Payta and Savanilla rhatany.
6. The origin of Para rhatany is unknown.
7. The substitution, in medicine, of Payta rhatany by another is inadmissible. There exist in regard to the tannin, chemical differences which deserve to be investigated. The tannins predominating,

or exclusively present perhaps in Savanilla and Para rhatany, produce bluish-black precipitates with iron salts.

Guarana. *Paullinia sorbilis*, Mart. M. C. Cooke, M.A. (*Pharm. Journ.*, 3rd series, i., 221.) The remarkable product called guarana has not been many years known in Europe. The tree whence it is obtained belongs to the order *Sapindaceæ*, and is abundant in the province of Amazonas, along the banks of the Tapajos, Rio Negro, etc., as well as in Guiana and Venezuela. The fruit, scarcely as large as a walnut, contains five or six seeds, which are roasted, then mixed with water, and moulded into a cylindrical form resembling a large sausage, then finally dried in an oven and offered for sale. guarana is used extensively in Brazil, Guatemala, Costa Rica, and other parts of South America, as a nervous stimulant and restorative.

Besides its medicinal properties, this substance has a reputation for affording a refreshing beverage similar in its effects to tea and coffee. It is grated into a powder, very like powdered cacao in appearance. Two spoonfuls of this powder are mixed in a tumbler of water, and this drink is regarded as a stimulant to the nerves, and, like strong tea or coffee, is said to take away the disposition to sleep.

The active chemical principle is an alkaloid first discovered by Dr. Theodore von Martius, and called by him guaranine, but since shown by Dr. Stenhouse to be identical with theine. Guarana contains more than double as much of this alkaloid as good black tea, and five times as much as coffee, the proportions being 5·07 per cent. in Guarana, 2·13 per cent. in tea, and 0·80 to 1·00 in coffee.* The same alkaloid is found to the amount of 1·25 per cent. in matè, or Paraguay tea, the produce of several species of *Ilex*.

It is rather a singular coincidence that the same alkaloid should prevail in all the principal substances employed in a similar manner as beverages in different parts of the world,—in the tea of China and India, the coffee of Arabia, the cacao of Central America, the matè of South America, and the guarana of Brazil. M. Fournier has found in the last-named substance, besides tannate of caffen, the following principles:—gum, starch, an acrid green fixed oil, a concrete volatile oil, scarcely soluble in water, a peculiar principle not precisely determined, and tannic acid.†

According to the "Technologist," there is exported annually from the city of Santarem about 16,000 lbs. of this substance, valued at

* For an account of Dr. Stenhouse's researches, see *Pharm. Journ.*, 1st series, vol. xvi., p. 212.

† *Journ. de Pharm.*, April 1861, p. 291.

eightpence or ninepence per pound, and on the Rio Negro it has been sold as low as one penny per pound. Specimens were exhibited in the Brazilian Court of the International Exhibition of 1862, made by the Amazonian Indians, who prepare it for their own use, and for conveyance to Para, Matto Grosso, and Goyaz. Six different preparations made in Vienna from this substance were also shown in the Austrian Court.

When guarana was first employed in France medicinally, it sold at the rate of from four shillings to twenty shillings per ounce, but has since gone down in price. It is included amongst the non-official substances of the "United States Dispensatory."

Its effects upon the system are said to be those of a tonic, but they do not appear to have been accurately investigated. It is habitually employed by the Indians of Brazil, either mixed with articles of diet as with cassava or chocolate, or in the form of drink, prepared by scraping it, and suspending the powder in sweetened water. It is considered by them useful in the prevention and cure of bowel complaints. Dr. Gavrelle, who was formerly physician to Dom Pedro in Brazil, called the attention of the profession to it some years since in France. He had found it advantageous in the diarrhoea of phthisis, sick headache, paralysis, tedious convalescence, and generally as a tonic. By Dr. Ritchie, surgeon in the British Navy, it is highly recommended in irritation of the urinary passages. Dr. Hervé has been in the habit of using it daily for five or six years, and has never failed to derive advantage from it in idiopathic diarrhoea, even in the most obstinate cases.

It may be given in substance, in the quantity of one or two drachms, scraped into powder, and mixed with sweetened water, but the most convenient form of administration is that of spirituous extract. According to M. Dechastelus, alcohol is the only agent which completely extracts its virtues, ether and water affecting this object but partially. Of the extract eight or ten grains may be given during the day, in the form of pill. It may also be taken along with chocolate as a drink.

Another species of *Paullinia* (*P. cupana*) growing on the banks of the Orinoco river, is also said to yield a similar substance. Guarana, or paullinia, as it is sometimes called, has never obtained general favour in this country.

On the Oil of Grape-kernels. A. Fitz. (*Deutsch. Chem. Gesell. Ber.*, iv., 442.) The kernels of grapes contain about 15 to 18 per cent. of a fatty oil. To investigate it the author saponified it with caustic potash, decomposed the potash salt by sulphuric acid, sepa-

rated the fatty acid, dissolved it in alcohol, precipitated the alcoholic solution with lead acetate, and extracted the lead precipitate with ether. In this way he obtained in the ether various acids, the analysis of which showed them to be palmitic, stearic, and erucic acids,—the latter forming about a half of the mixture. Besides these the oil of kernels contains a small quantity of another acid whose composition could not be ascertained, as it formed a glairy syrup. All these acids are combined in the oil with glycerine.

Parasite on the Lemon. (*Nature*, iii., 255.) At a recent meeting of the Scientific Committee of the Royal Horticultural Society, Mr. Alfred Smee exhibited some lemons from Sicily which had been attacked by a species of *coccus*, quite distinct from the well-known *coccus* of the orange, and apparently an undescribed species. It was stated that nearly the whole of the lemon crop in Sicily is attacked by this parasite, which renders it almost valueless for the English market. Although the juice is not much affected, the skin is completely spoiled, and rendered uncrystallizable. The root appears to be at the same time attacked by a fungus.

Preservation of the Oils of Orange and Lemon. Carl Fruh. (*Amer. Journ. Pharm.*, May 1871.) The author has succeeded in keeping these oils perfectly fresh and fragrant for over a year, by the following plan :—To every pound of the oil one ounce of alcohol is added and well mixed; then an ounce of water is put with it, which again withdraws the alcohol from the oil, and collects at the bottom as dilute alcohol. After some time a resinous film is observed floating on the surface of the dilute alcohol.

Ailanthus excelsa. Marayan Daji. (*Pharm. Journ.*, 3rd series, i., 154, 175, 193.) The author, a graduate in medicine at Bombay, has communicated to the Grant College Medical Society, a long and elaborate paper, introducing to the notice of the medical profession in India a new remedy, the bark of the *Ailanthus excelsa*, Roxb. (*Simarubaceæ*). This tree is pretty common in many parts of India, growing on the plains and open valleys, amongst mountains, and a few miles inland from the coast. A somewhat dry climate, having a considerable range of temperature, appears to be favourable to its growth. The bark, which seems to be the only part of the tree possessing medicinal activity, is collected either in the cold or the beginning of the hot season. Owing to the hygroscopic nature of the active principle it contains, care must be taken in its collection to preserve it from contact with moisture, and dry it as quickly as possible. It is remarkable as containing a reddish or orange yellow, somewhat glistening substance, which abounds within the inner part

of the liber. This substance is very soluble in water, extremely bitter, and consists of the lime salt of a peculiar acid, which the author names ailanthic acid. It is the active principle of the plant, and occurs in the largest proportion in the thick bark of old trees. The author gives the results of a chemical examination of the bark, and the method of isolating the ailanthic acid, which is the most important constituent. This acid is an uncrystallizable substance very soluble in water, but not dissolved by other solvents, of a waxy consistence, and reddish brown colour. It forms soluble salts with lime and with lead, which are also uncrystallizable, and possess a yellow colour. The medicinal and physiological properties of this tree, resemble very closely those of quassia. As *ailanthus* bark owes its efficacy to the ailanthic acid contained in it, there is scarcely any difference of action between the two except in the dose. One to three grains of ailanthic acid, when given internally, act as a tonic and stomachic, exciting the appetite and promoting digestion. When given continually in larger doses (from grs. iii. to grs. v. two or three times a day) its digestive and alterative action is distinctly marked, especially in cases of torpid states of the digestive function, attended with muscular and nervous relaxation and constipation. It increases secretions, especially that of the liver, as indicated by the stools changing their colour to yellow, improves the tone of the muscular and nervous system, and produces a corresponding healthy change in the general system. Although it much resembles the pure bitters, such as gentian or chiretta, yet its action is specially marked by a peculiar stimulation of the digestive and secretory processes. In dyspepsia, anorexia, and torpid states of the digestive organs, accompanied with habitual constipation, ailanthic acid has been found very serviceable. It is particularly useful in cases where the indigestion results from a want of tone in the general system, such as occasionally occurs in the convalescence from fevers, and from the frequent use of purgatives. Its beneficial effects in these cases have been more marked than those from the use of other ordinary bitter tonics.

In hæmorrhoids and prolapsus recti, it can be advantageously administered in combination with other remedies which are employed with the view of freeing the portal circulation.

*Ailanthus Bark** can be best prescribed in the form of decoction, infusion, extract, or tincture. The following formulæ were used for the different preparations:—

Decoction of Ailanthus Bark:—Take of *ailanthus* bark bruised,

* The bark should always be deprived of its thick epiphloeum before use.

four drachms; distilled water, one pint; boil for ten minutes in a covered vessel, then strain and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.

Dose.—From one to two fluid ounces twice or thrice daily. It contains ailanthate of lime.

Infusion of Ailanthus Bark.—Take of ailanthus bark, bruised, two drachms; cold water, ten fluid ounces. Infuse in a covered vessel for half an hour, and strain.

Dose.—From one to two fluid ounces twice or thrice daily. It is a cleaner preparation than the decoction; only prescribed in dyspepsia.

Tincture of Ailanthus Bark.—Take of ailanthus bark, bruised, one ounce and a half; proof spirit, one pint; macerate for seven days in a closed vessel with occasional agitation; then strain, press, filter, and add sufficient spirit to make one pint.

Dose.—From half a drachm to two fluid drachms.

Extract of Ailanthus Bark.—Take of ailanthus bark, bruised, one pound; distilled water a sufficiency. Macerate the bark with eight fluid ounces of the water for twelve hours; then pack in a percolator and adding more of the water, allow the liquor slowly to pass until the bark is exhausted. Evaporate the liquor; filter before it becomes too thick; and again evaporate by water-bath until the extract is of a suitable consistence for forming pills.

Dose.—From three to five grains, either alone or combined with other tonics or alteratives.

American Sumac. (*Scientific Amer. and Pharm. Journ.*, 3rd series, i., 972.) Since the war, and in the reversal of fortune consequent thereto, many of the people of the South have turned their attention to other sources of revenue than the former staples of tobacco, corn, and cotton, and this necessity has developed new and heretofore neglected sources of revenue. For instance, it is said that one county alone of the State of North Carolina shipped North last winter about \$100,000 worth of quails (called partridges there), not to speak of the new industry of "*truck farming*," in which men are now making fortunes, who a few years ago would have thought it almost a disgrace to sell so apparently insignificant a thing as a strawberry.

Among these new industries, and rising rapidly into importance, are the gathering and manufacturing for market of sumac. This article is used as a dyestuff and for tanning morocco. Formerly all used was brought from Europe; now the Southern States supply a large

quantity, already supplanting the lower grades of the foreign article, and it is hoped ere long also to take the place of a finer grade.

The difference between American and foreign, or, rather, American and Sicilian first grades, is probably due to the fact that the latter is cultivated; the former is as yet a wild product growing on those vast fields of so-called worn-out land abundant through the South from their former wasteful system of farming. However, one of the largest dye-manufacturers says that the tannin in the Southern sumac seems to be in a different form from the Sicilian, and hence the latter is still preferred by dyers, especially for fine work. Still this may be due merely to cultivation, as all know the changes that have been made from time immemorial in various grains, grasses, and fruits by culture and care.

Tanners of morocco say that the Southern sumac, when carefully gathered, free from sticks and dirt, the leaves and leaf-stem only, is equal in tannin strength to the best Sicilian; that with Sicilian at \$175 per ton such sumac finely ground should bring \$125 per ton. The usual price is \$50 to \$90, and it has sold at \$110. It is like everything else; it pays to put it on the market in the best order possible.

In treating of the operation of gathering and preparing for market, we shall first state something of the different varieties of sumac. There are six botanically different varieties of sumac in the United States; of these, three are of value, one is of little or no use, and two are poisonous. The first three resemble each other very much in leaf and size, growing from four to ten and fifteen feet high, chiefly on dry uplands, in old fields. Of these three, two have hairy berries and one has a hairy down on the branch, like that on a deer's horn in summer; the third has a perfectly smooth berry and branch. The leaves of all these are valuable, though probably, if care were taken to keep them separate, the hairy or stag-horn sumac would be found most valuable for dyeing.

Of the other three, the dwarf sumac, one or two feet high, is valueless; another grows only in swampy places, and while its juice is said to make a fine varnish, used largely in Japan, yet it is so poisonous to many persons that it is best let alone; the third is the well-known poison oak.

In gathering the sumac, leaves and leaf-stems should be carefully picked without any of the woody stem, then dried under cover on lattice-work shelves to give free access to air, frequently stirring or turning to prevent heating. When thoroughly dried, at the end of two or three weeks, it is sent to New York or to the nearest mill for

sale. In this state it is worth from \$1.25 to \$1.75 per hundred lbs., but woody stems and dirt detract from its value very much. The buyer in the interior of Virginia, North Carolina, South Carolina, and Georgia can seldom afford to pay more than \$1 per hundred.

At the mill it is ground very fine and screened. The mill is of the usual drug-mill form: an upright wheel revolving on its edge in a circular trough, as the old fashioned mill for grinding clay. It should be tightly enclosed; if not, a large quantity of the light, fine, powdered sumac will escape and be lost. On care and economy in this operation depends the miller's profit. After grinding, it is screened and packed in bags, 162 lbs. to the bag, and thus sent to market. The bags to hold this quantity should be cut out 40×60 inches. Fourteen such bags will hold a ton. This is exactly the style and weight that Sicilian sumac is packed as sent to the United States. To sell well, it should be of a light green colour.

The time of gathering is from July 1st to just before first frost, not later; in some parts it may commence earlier. It should be done when the flower is in full bloom, not before.

It is stated that the consumption of sumac in Great Britain is over 20,000 tons per annum, and that it is yearly increasing. In the United States 3500 tons of native, and perhaps 3000, or over, of foreign are used; probably 500 tons of native growth are exported. As the demand and uses for leather never grow less, it is not at all probable that all which the South can produce, if properly prepared, will ever fill the needed supply; and if it should create a plethora on the market, it would only cause new uses to be found for it, or engender the production of a finer article.

There is no reason why at least 5000 tons should not be exported to Europe, besides supplying home demands. The mill machinery is said to cost \$2500 without power. With the crude article at \$1.50 per hundred even, \$12 to \$15 per ton for grinding and bags, \$10 for loss, and \$10 for freight to New York, there is certainly a fair margin of profit at \$90 per ton, at least, which price a good article will certainly always bring in New York. These figures of cost also are rather high. There is plenty of room for at least ten more mills in the now unoccupied field of North Carolina, South Carolina, and Georgia. Any good business place in the upper or middle sections of these states will do as a site.

We have stated that sumac is used for tanning and dyeing. For these purposes the user generally makes his own decoctions, and uses them when fresh and warm. It is stated that the liquor injures by standing. For tanning it is valued, as it does not discolour the

leather. It is used in the same manner as a decoction of bark. Best Sicilian contains, according to Muspratt, sixteen per cent. of tannin, and Virginian ten per cent. We have no doubt the vastly improved mode of gathering and preparing the American sumac will now increase its quantity of tannin.

In dyeing, it is used to produce a fawn and a rich yellow, a black, a peculiar shade of green, and a red. The mordants are usually tin or aluminous substances.

With brazil wood and tin solution, it produces a red; with copperas and logwood, a rich permanent black. With a solution of chloride of tin alone, a rich yellow; and this with Prussian blue, shades of green. It is used chiefly as a base, and has the quality of giving great permanency to the colours dyed with it. The leaves of the hairy species called staghorn, are considered best to dye yellow.

The sumac berries are of very little value, though we think in the progress of science a use will be found for them. They are said to contain large quantities of malic acid. They are now used in small quantities by the druggists, and when ripe, make a very refreshing and cooling beverage. They should by all means be kept out of the gathered leaves, as they contain a red dye which would injure the quality of the sumac.

Frankincense, or Olibanum.* G. Birdwood, M.D. (*Pharm. Journ.*, 3rd series, i., 163, from *Trans. Linnean Soc.*, vol. xxvii., p. 111.)

The burning of incense for purposes of worship is of very old date, it being represented in painting and sculpture on the monuments of Egypt and Assyria. The first mention of it and of the use of frankincense occurs in the Bible. In Exodus xxx. 34-36, we read that "Stacte and onycha and galbanum, with pure frankincense," were the "sweet spices" from which the "pure and holy perfume" or "confection" of Divine prescription which was offered on the "altar of incense," was to be made "after the art of the apothecary." In other parts of the sacred writings it is often mentioned, Sheba being indicated as its source.

Herodotus (born B.C. 484) mentions frankincense frequently, and affirms that Arabia was the only country producing "frankincense, myrrh, cassia, cinnamon and ladanum;" and that the frankincense trees were guarded by winged serpents, "small in size, and of varied colours, whereof vast numbers hang about every tree . . . and there is nothing but the smoke of the storax which will drive them

* *Transactions of the Linnean Society*, vol. xxvii., pp. 111-148. On the Genus *Boswellia*, with Descriptions of Figures of Three New Species. By George Birdwood, M.D., Edin. Communicated by Daniel Hanbury, Esq., F.R.S. and L.S.

from the trees." The Greeks obtained their storax from the Phœnicians.

Theophrastus (B.C. 394–287) gives the fullest and most accurate account of frankincense of all ancient writers. Dr. Birdwood has supplied the following translation:—

"Concerning frankincense and myrrh and balsam, and whatsoever is like these, it has [already] been said that they are produced by incision and spontaneously. And we must [now] endeavour to tell what is the nature of the trees, and if they have anything peculiar as to their origin, or collection, or other matters; and, in like manner, concerning the other sweet-smelling trees; for almost the whole of them grow in places towards the south and east. The frankincense-tree, and myrrh, and cassia, and cinnamon grow in the Chersonese of the Arabians, about Saba, and Adramyta, and Citibœna, and Mali. But the trees of frankincense and myrrh grow, some of them on the mountain and others in private plantations at the foot of the mountain, on which account some of them are cultivated and others are not; and they say that the mountain is lofty and thickly wooded and covered with snow, and that rivers also flow down from it into the plains, and that the frankincense-tree is not large, being five cubits high and covered with boughs, and that it has a leaf like that of the pear-tree, only much smaller, and is of a glassy colour, very like rue, and has altogether a smooth bark like the laurel; but that the myrrh-tree is still smaller in size and more shrub-like, and that it has a hard trunk, and is twisted towards the ground, and is thicker than a man's leg, and has a smooth bark like purslane. But others, who say they have seen them, nearly all agree concerning their size, namely, that neither of the trees is large, the myrrh-tree being the smaller and lower [of the two]. And they state that the frankincense bears a resemblance to a laurel, and that it has a smooth bark, but that the myrrh is prickly and not smooth, and that it has a leaf like the elm, only crisp and prickly at the top, like the ilex tree. And they say that in a voyage they were making from the Bay of Heroes, they disembarked to search for water on the mountain, and thus saw the trees and the mode of collecting [the frankincense]. And that the trunks and boughs of both were incised; but that the former appeared to have been cut, as it were, by an axe and the latter to have had more gentle incisions; and that the drops partly fell down and partly remained on the tree. And that in some places mats woven of palm-leaves were placed underneath, while in others the ground underneath was hardened and kept clean; and that the frankincense on the mats was pure and transparent, but that on the

ground less so; and that they scraped off what adhered to the trees with knives, so that the bark stuck to some of them. And they said that the whole mountain was divided amongst the Sabæans; for that they were the lords [of the place], and that they were just towards one another, on which account no one kept any guard [over his own property]; and that having themselves taken thence an abundance of frankincense and myrrh, which they placed in their ships, none of the inhabitants being present, they had sailed away. And these both told this, and said that they heard that the myrrh and frankincense is gathered together on every side to the temple of the Sun; and that this belongs to the Sabæans, being by far the most sacred thing in the country, and that certain armed Arabs have the custody of it; and that when they bring it, each heaping up his own frankincense and the myrrh in a similar way, leaves them with the keepers, and placing upon the heap a little tablet, stating the number of measures and the price at which each measure is to be sold; and that when the merchants come, they inspect these tablets, and having measured any heap that pleases them, they put the price of it in the place from which it is taken; and that the priest then coming takes a third part of the price for the god and there leaves the remainder, which is kept safe for the owners until they come and take it. But certain others say that the frankincense-tree is like the lentisk, and its fruit to the berries of the same, and that the leaf of it is reddish; and that the frankincense from the young tree is whiter and less fragrant, while that from the older trees is yellowish and more fragrant; and that the myrrh-tree is like the terebinth, but rougher and more thorny and the leaf a little rounder, and, if chewed, resembling the terebinth in taste; and that of these, also, the older are the more fragrant. And that both grow in the same place, and that the ground [there] is argillaceous and flaky, and that springs of water are rare. These things, however, are contradictory [to the statement] that it snows and is wet [in that locality] and that rivers issue from it. And others also say that it is like the terebinth, and others that it is the terebinth itself; for that specimens of the wood were brought to Antigonus by the Arabs who conveyed the frankincense, and that they differed in nothing from the terebinth. These, however, showed still greater ignorance, for they thought both the frankincense and the myrrh grew on the same tree. On which account, the report brought by those that sailed from the City of Heroes is more credible; since the frankincense-tree that grew above Sardis, in a certain temple, has a leaf like the laurel, if from this we can form a conclusion, and the frankincense produced from it, whether from the trunks or

branches, is like the other frankincense in appearance and smell when it is burnt. And this tree alone grew without [any culture]. And some say that the frankincense grows more abundantly in Arabia, but more beautifully in the neighbouring islands, over which the Arabs have sway; for there they make figures upon the trees of whatever they like; which is not incredible, as they admit of any incisions that persons may wish to make in them. Some of the grains also are very large, in bulk as much as a handful, and in weight more than the third part of a mina. All frankincense is brought to the market in a rough state, similar in appearance to the bark of a tree; but of myrrh there are two kinds, the one in drops and the other in moulds. The quality is judged by the taste; and from this they choose what is of uniform colour. Concerning frankincense and myrrh, this is nearly as much as we have heard up to the present time."

Diodorus (about B.C. 50) gives a long account of this substance, in which he gives a very glowing description of Arabia the Happy, where the air is so highly perfumed with frankincense and other odoriferous trees "that it even ravishes the senses with delight, as a thing divine and unutterable," and the perfume is wafted out to sea, so that those sailing near the coast are entertained "with its pleasures and delights." He also gives credence to the myth of the trees being surrounded by fearful serpents. Speaking of an island off the coast of Arabia called Holy Island, on which no one was allowed to bury their dead, he says,—

"The sacred isle produces frankincense, and in that abundance as suffices for the service and worship of the gods all the world over; it has likewise plenty of myrrh, with other odoriferous spices of several sorts, which breathe out a most fragrant smell. The nature of frankincense, and the manner of getting it, is thus: the tree is very small, like to the white Egyptian thorn, and bears a leaf like to the willow; it puts forth a flower of a golden colour; from the bark of this tree, by incision made, distils the frankincense in drops like tears."

Strabo (B.C. 54—A.D. 24) says,—

"Frankincense is produced in Catabania, and in the parts of Arabia opposite. Here the frankincense-tree grows along the banks of the Isis and Nilus. The country of the Sabæi produces not only frankincense but balsam, sweet-smelling palms, calamus, and larimnum, a most fragrant perfume. By the trade in these aromatics the Sabæans and the Gerrhæi have become the richest of all the tribes."

Pliny (A.D. 23—79), too, gives a long account, agreeing in most

particulars with Theophrastus. He says that the gum was at first only collected once a year, but when a greater demand sprang up, the inhabitants "feeling the sweetness of the gaine," made a double vintage,—the first and best in summer, about the dog-days, and the second in the spring; the first being called *Carpheotum*, and the second or spring crop, much inferior to the first, *Dathiatum*.

Ptolemy (about A.D. 150), in his *Geography*, places the *libanotophoros*, or *thuriferous* region, between *Makalla* and *Muscat*.

The casual notices of frankincense by the Latin poets and historians are, as Dr. Birdwood observes, very valuable in the present argument, and are very numerous. The most pertinent of them are quoted by Celsus in his "*Hierobotanicon*," who "makes a very determined effort to exhaust all the learning on the subject," and "very well proves how impossible it is to be universally learned on even so infinitesimal a subject as frankincense."

The high honour in which frankincense was held by the ancients is shown by its being one of the three gifts brought by the magi to the infant Saviour.

The Arabian writers all agree that frankincense is produced in the *Hadramaut*, though *Serapion* and *Avicenna* copy *Dioscorides'* mistake in saying it was also produced in *India*. *Ibn Batuta* says:—

"Leaving *Zofar* (*Dofar*, *Lee*; *Sephar* of the Bible? *G.B.*), I proceeded to sea towards *Amman*, and on the second day put into the port of *Hasik*, where many Arab fishermen reside. We have here the incense-tree. This tree has a thin leaf, which, when scarified, produces a fluid like milk, this turns into gum, and is then called *loban*, or frankincense."

Marco Polo, a European writer, says of the city of *Escier*, or *Escher*:—

"This district produces a large quantity of white frankincense of the best quality, which distils, drop by drop, from a certain small tree that resembles the *fir*. The people occasionally tap the tree or pare away the bark, and from the incision the frankincense gradually exudes, which afterwards becomes hard. Even when an incision is not made, an exudation is perceived to take place, in consequence of the excessive heat of the climate.

"The frankincense is so cheap in the country as to be purchased by the governor at a rate of ten bezants the quintal, who sells it again to the merchants at 40 bezants. This is done under the direction of the *Soldan* of *Aden*, who monopolises all that is produced in the district, and derives a large profit from the resale."

Thevet says that frankincense is produced, with *myrrh*, in the

country about Pecher (Sheher?) and Fartack, cities of the kingdom of Aden; that there are two kinds, the best being whitish, pure, clean-cut, and solid, collected in summer; the second, a reddish kind, collected in spring; also that the tree resembles the resinous *firs*. He gives a figure, which Dr. Birdwood takes to be an undoubted *Boswellia*, with a background of *firs*.

Garcia ab Horto, from whom Gerard copies, says that no frankincense is produced in India, and he wonders that such a mistake should have been made; that there are two kinds, the best produced on mountains, and the dark and inferior produced in the plains; that the darker kinds of frankincense are called Indian by the Arabs. His figure is a copy of Thevet's without the background of *firs*.

The word *olibanum*, as a synonym for frankincense, was used by Pope Benedict IX., in 1033, and by Gerard in his translation of Avicenna, in 1490.

Purchas, in "His Pilgrimes" (London, 1627) notes *olibanum* amongst other articles brought by the Arabs for sale on the Arabian coast.

Celsus, in his "Hierobotanicon," has the following information regarding the native country of *olibanum*:—

"It is most true that frankincense does not grow in any part of India, since whatever frankincense is consumed in India, and whatever is conveyed thence to Portugal, is brought out of Arabia, where alone it grows, and is called *Lovan*. On which account I believe that writers are mistaken who consider that it is *libanum* in Greek, and *olibanum* in commerce, from the fact of its growing in Mount Lebanon."

Linnæus referred frankincense to a *Juniperus*, *J. lycia*.

Dr. Birdwood says he takes the statement at second hand. This is, however, true. Linnæus in his "Materia Medica" (Schreber's ed., Alt., 1772) says,—

506. JUNIPERUS LYCIA foliis ternis undique imbricatis ovatis obtusis. *Koy. Mgdb.*, 90 Sp. Pl. 1471.

Cedrus, folio cupressi, major, fractu flavescente. *Bauh. Pin.*, 487.

Loc.: Africa, Æthiopia, Arabia, *Arbor*, *peregrina*.

PHARM. OLIBANI (THURIS) Resina, granulata, oleum stillatitium, etc., and in a foot-note "OLIBANUM ex hac arbore desumptum esse alii statuunt, alii negant, et Sandaracam non prioris sed hujus esse resinam volunt alii; *lis pendet*."

Bruce, whose narrative of travels met with so much undeserved opposition and incredulity, actually figures in his atlas a plant, after-

wards named by Richard *Boswellia papyrifera*, remarking that it was called *angouah* by the people about Tacazza, and believed by the Abyssinians to be the true frankincense; he adds, "in reality it produces a gum much resembling it."

In 1807, Colebrooke proved that a frankincense-like gum was yielded by *Boswellia serrata*, of Roxburgh (= *B. thurifera*, Colebr.). From this it was concluded that this plant yielded the olibanum of commerce, and it was even denied that Arabia yielded any.

Bruce's plant was afterwards described by two botanists under different names; in 1820, by Delile, under the name of *Amyris papyrifera*, and by Endlicher in 1838, under the name of *Plösslea floribunda*.

Wellstead, in 1838, found that large quantities of olibanum were exported from the Soumali coast. He says, "two kinds of frankincense are brought here for exportation to Hindustan, one called *Luban*, from Hadramaut, which is a powerful aromatic, used in the temples and houses for fumigation; the other, *Luban-mati*, less fragrant, but preferred for chewing."

Cruttenden, in 1837, saw the frankincense-tree on his journey from Merbat to Dyreez, the principal town of Dejar, and in 1843, the frankincense-tree of the Soumali country. He is reporting on the Mijjertheyn tribe of Soumalis, and says,—

"During the hot season the men and boys are daily employed in collecting gums, which process is carried on as follows:—About the end of February or beginning of March, the Bedouins visit all the trees in succession, and make a deep incision in each, peeling off a narrow strip of bark for about five inches below the wound. This is left for a month, when a fresh incision is made in the same place, but deeper. A third month elapses, and the operation is again effected, after which the gum is supposed to have attained a proper degree of consistency. The mountain sides are immediately covered with parties of men and boys, who scrape off the large, clear globules into a basket, whilst the inferior quality that has run down the tree is packed separately. The gum, when first taken from the tree, is very soft, but hardens quickly. The flame is clear and brilliant, and the traveller is frequently amused by seeing a miserable Bedouin family, cowering under a wretched hovel, eating their scanty meal by the light of half-a-dozen frankincense torches. Every fortnight the mountains are visited in this manner, the trees producing larger quantities as the season advances until the middle of September, when the first shower of rain puts a close to the gathering of that year."

The export, he goes on to say, is in the hands of "those never-failing speculators, the Banians of Porebunder (Kattiarwar) and Bombay." At the close of the north-east monsoon they arrive at the coast, and settle at Feluk (Mount Elephant of the ancients, Cape Felix of the Portuguese, and Jibbel Feel of Captain Saris), Bunder Marayah, Bunder Khor, and other Bunders. "The Bedouins from the interior immediately visit them, and, as there is no one to compete with them, they manage to engross the greater part of the trade." He estimates that the quantity annually exported is—

To Bombay	377 tons.
To Red Sea.	235 „
To Arabia	120 „

—
732

"The trees that produce *luban*, or frankincense, are of two kinds, *Luban meyti* and *Luban bedowi*. Of these the *meyti*, which grows out of the native rock, is the most valuable, and, when clean-packed, and of good quality, it is sold by the merchants on the coast for one and a quarter dollars per frasila of twenty pounds. The *Luban bedowi*, of the best quality, is sold for one dollar per frasila: of both kinds the palest colour is preferred. The trees vary greatly in height, but I never saw one above twenty feet with a stem of nine inches in diameter. Their form is very graceful, and, when springing from a mass of marble on the brink of a precipice, their appearance is especially picturesque."

In 1843, Kempthorne and Vaughan visited the Soumali country. Kempthorne's specimen was identified by Mr. Bennett, of the British Museum, with Endlicher's *Plösslea floribunda*, but on the agreement of the peculiar papery character of the barks only. Dr. Vaughan, in "Notes upon the Drugs observed at Aden," mentions the following kinds:—*Luban maitee*, *Luban nankur* or *aungure*, *Luban makur*, *Luban berbera* or *muslika*, and *Luban Marbat* or *Saharee Luban*, the finest kind. Vaughan's original specimens are in the Pharmaceutical Society's museum.

In 1847, Carter published a figure of the frankincense-tree of Arabia, accurately defining the thuriferous region. He says,—

"Coming from the north-east, we first meet with the frankincense-tree on the Sabhan mountains in latitude 17° 30' N. and longitude 55° 23' E., where the desert ends, and the wooded mountainous region commences; and, following the coast, which runs south-west, we find the frankincense exported from the different towns gradually diminishes after the Bay of Al Kammar until we arrive at Makalla,

from whence none is exported from the interior of Arabia, and but little used, except what is brought from the African coast opposite that town. By the same inquiry we learn that the produce of the Arabian trees is exported in large quantities from places on that part of the coast which intervenes between the latitude and longitude mentioned (viz. $17^{\circ} 30'$ N. and $55^{\circ} 23'$ E.), and the town of Damkote in the Bay of Al Kammar, $52^{\circ} 47'$ E. longitude. Between these two points the trees are congregated in two distinct localities,—on the summits and sides of the highest range of mountains near the coast, and on the plain between them and the sea; the former is called *Nedjee*, or highland, and the latter *Sahil*, or plains on the coast. The *Nedjee* is about two days' journey from the shore: it is the most elevated portion of the great limestone formation of this coast, which, from a height of 5000 feet here, descends in sudden and lofty steps upon the Arabian Sea. To get to it you first cross the *Sahil* already mentioned, and then ascend a minor range, which is covered with long grass and trees, and, after passing a less fertile region, called the *Gāthān*, at last arrive at the *Nedjee*, where there is no grass and but few trees beside those which produce the frankincense. The soil is red and subargillaceous, and, in consequence of its scarcity, the trees are generally found growing out of the crevices of the limestone rock. It is from this part that the frankincense is chiefly brought, and as I have before said, the largest quantities of it are exported from the different towns on the coast between the longitudes $50^{\circ} 47'$ and $55^{\circ} 23'$ E.

“The libanophorous region, therefore, lies behind the towns on this part of the coast where Theophrastus places it, and not, as Ptolemy places it, in Oman.”

Mr. Carter also procured dried and living specimens of the tree, and made careful drawings of them. In 1859, when Dr. Birdwood took charge of the Agri-Horticultural Society's “Old Gardens” at Bombay, he found Carter's plant still living. Through the kind exertions of Colonel Playfair, then at Aden, he obtained a fine collection of several varieties of dried specimens and cuttings of the African frankincense-tree, together with the frankincense yielded by them. Both Carter's and Playfair's plants have since flowered, and thus allowed of their being named.

Dr. Birdwood, in his “conclusions,” says:—

“It will I believe, be now agreed that Arabia produces frankincense, and in the very region indicated by common opinion of the ancient world, and so accurately limited by Theophrastus. Now that it has been demonstrated by Carter that the libanotophorous

region lies along the coast of Hadramaut, the agreement between the statements of the Bible, Herodotus, Theophrastus, Diodorus Siculus, Strabo, Pliny, Arrian, Ptolemy, the Arabs, Marco Polo, Bochart, and Celsus is very striking. It will, I believe, be agreed also, as implied in the more ancient references to Arabia, and expressly asserted by Diodorus, Strabo, Arrian, and others of the ancients, and demonstrated with such fulness by Cruttenden, Kempthorne, and Vaughan, and the overwhelming evidence of modern travellers (beginning with Bruce) generally, that the Soumali country also produces frankincense and probably the bulk of the olibanum of commerce. The agreement as to the region about Mount Elephant (Ras Fieluk, Cape Felix, Jibbel Feel) between Arrian, Captain Doventon and Captain Saris, in Purchas, Milburn, Cruttenden, Kempthorne, and Vaughan is indeed quite startling.

"It will be admitted also, I believe, that *Boswellia Carterii* (Mohr Madow), which—with *B. Bhau-Dajiana* (Mohr-Add), the source of the bulk of the olibanum of commerce exported from the Soumali country—is the same species as the plant (*Maghrayt d'sheehaz*) which Carter found produced the frankincense of the Hadramaut, and also that *Boswellia thurifera* (including *B. glabra*) of India and *B. papyrifera* of Abyssinia, although thuriferous species, are not known to yield any of the olibanum of commerce.

"It is very surprising that so great weight of evidence in favour of frankincense being produced in Arabia Felix and the Soumali country should ever have been set aside for the idle fancy that India was the source of the olibanum of commerce."

Dr. Birdwood rightly attributes at least a portion of this mistake to a most prolific source of error, namely, the alteration which has taken place in the trade routes.

In the Paris Universal Exhibition of 1867, Dr. Birdwood noticed several bottles of frankincense labelled "Olibanum, so called because it comes from Mount Lebanon;" also aconite labelled "*Aconitum Nepaullus*, so named because its root is the famous poison of Nepal"!

Dr. Birdwood then gives descriptions of the genus *Boswellia* and the species belonging to it, as enumerated below, with the synonyms of each species.

Genus BOSWELLIA.

Roxburgh, Pl. Corom. iii., p. 4, t. 207; Benth. and Hook. Gen. Plant. i., p. 322.

Libanus, Colebrook in Asiat. Res., ix., p. 377, t. 5, f. 1.

Plösslea, Endlicher, Nov. Stirp. Dec. 47; Iconog. t. 119, 120.

Species 5; natives of Nubia, Abyssinia, Berbera, Arabia, and India.

1. *BOSWELLIA CARTERII*, Birdwood, n. sp. (with figures).

B. thurifera, Colebrooke? Carter in Journ. Bombay Br. Roy. As. Soc., ii., 1847. "Mohr Madow," Playfair; "Maghrayt d'sheehaz," Carter; These are two varieties.

HABITAT. Soumali mountains, Africa; Hadramaut mountains, Arabia.

2. *B. BHAD-DAJIANA*, Birdwood, n. sp. "Mohr-Add," Playfair.

HABITAT. Soumali mountains.

These two species yield the bulk of the olibanum exported from the Soumali country under the name of "Laban-Sheheri."

3. *B. PAPYRIFERA*, Richard, Tent. Flor. Abyss., etc., iv., p. 140, t. 33.

Amyris papyrifera, Delile, Cent. Pl. d'Afrique; Caillaud, Voyage à Meroé, ii., p. 293.

Plössleu floribunda, Endl. Nov. Stirp., etc., n. 47, t. 119, 120.

"Angouah," Bruce's Travels, vii., p. 334, tab. 48.

HABITAT. Senaar, Soudan, Gondar, and the valley between the Taccaze and Mareb.

4. *B. THURIFERA*, Colebrooke, Asiat. Res., ix., p. 377, t. 5.

B. serrata and *B. glabra*, Roxb. Flor. Ind., ii., pp. 383, 384.

B. glabra, Roxb. Cor. Pl. ii., t. 207.

"Salai," India (Birdwood).

HABITAT. In the mountains of Tropical India; Oude and Rohilkund, Royle; Behar, Hooker; Concan, Stocks; Kattyawar, Khandeish, H. M. Birdwood.

There are two varieties of this plant and its gum-resins recognised by the natives of India, of which Roxburgh made two species.

5. *B. FREREANA*, Birdwood, n. sp. (with figure). "Yegaar," Playfair. "Louban maitee" of the Soumalis. "Louban meyti," Cruttenden.

HABITAT. In the white limestone mountains about Bundah Murayha.

We are highly grateful to Dr. Birdwood for this very interesting and valuable paper, which must have cost him immense labour and painstaking research. It is, without doubt, one of the best monographs on any materia medica substance we have had for some time, and will receive the recognition it is so well entitled to. Dr. Birdwood tells us that this is the "first of a series of monographs on such of the vegetable products of the East, the history and botany of which need further elucidation." We look with interest

for further contributions from his pen, especially when we find he has not overlooked one of the most fundamental desiderata of economic botany, that of procuring really well-authenticated specimens of the products collected from the plants themselves. He tells us that nearly all the gums and resins in the Bombay Museum were collected by his own hands.

Monkey Nuts. (*Pharm. Journ.*, 3rd series, i., 488, from *Nature*.) The pods of the ground nut (*Arachis hypogæa*), commonly known by the name of "monkey nut," chiefly used for the expression from the seeds of a light-coloured bland oil, said to be extensively used for mixing with olive oil, are now reported to be used in America for making so-called chocolate. For this purpose they are beaten up in a mortar, and the mass compressed into cakes; and it is said to form a most agreeable chocolate, without a particle of true cocoa. The Americans also prepare the seeds as a desert sweetmeat by parching them and beating them up with sugar.

Mode of preparing the Cutch of Commerce from the Acacia Catechu. Claude Dumaine. (*Journ. Agric. Soc. India*, i., 399.) Of this tree there are two varieties, a white and a red kind; but the cutch, or catechu, is almost always prepared from the red kind, the white being seldom cut down. Cutch, or catechu, is prepared thus:—The tree is cut down to about 6 to 12 inches from the ground, and chopped into small pieces, the smaller branches and bark being rejected. The chopped wood is then taken to the place of manufacture, generally under trees in the open air, and placed over a brisk fire in mud jars, called *gharrahs*, filled with about two-thirds of water. This is allowed to boil down till, with the extracted matter, it forms a liquid of syrupy consistence. The contents of several jars are then poured into a larger jar, and again placed over a brisk fire for a period of from two to four hours; and, when sufficiently boiled down, it is poured out over mats covered with ashes of cow dung, and allowed to dry. The wood when dry is used for fuel.

Adulteration of Catechu. (*Pharm. Journ.*, 3rd series, i., 366.) It is a well-known fact, that catechu is often adulterated; the sophisticated substance injuriously affecting various operations in which it is employed, especially dyeing and calico-printing. According to Tissandier, genuine catechu, when exhausted by means of ether, loses 53 per cent. of weight, leaving, after drying, 47 per cent. of residue. A mixture of catechu and alum gives a white precipitate with nitric acid and with chloride of barium.

The Tamarind. John R. Jackson, A.L.S. (*Pharm. Journ.*,

3rd series, i., 863.) The tamarind (*Tamarindus Indica*, L.) is well known in this country as an agreeable and useful medicinal preserve. There is only one species of the genus, of which, however, there are two varieties, one growing in the East, and the other in the West Indies. The chief difference is in the length of the pods, those of the Eastern plant being from three to six inches long and slightly curved, and containing from six to twelve seeds, while the Western variety is shorter, and seldom has more than four seeds. The trees grow to a great height, attaining in the East Indies eighty feet. The pinnate leaves and racemes of yellow and red-streaked flowers, with purple filaments, give it a pleasing and graceful appearance.

The wood is excessively hard, and so heavy that it sinks in water. It is peculiarly marked with broad chocolate-brown streaks. In the East Indies it is used for furniture and for general building purposes. Tamarinds, as seen in commerce, consist of the pulpy or fleshy part of the pods, after the outer shell has been removed, preserved in syrup or sugar. The mode of preserving them is either by throwing hot sugar from the boiler on the ripe, pulpy portion of the pods, or by placing alternate layers of tamarinds and sugar in stone jars: preserved in this way they are said to have a finer flavour and better colour. Tamarinds are valued with us, as well as in nearly all the countries where they grow, for their gentle laxative and cooling properties; they are, moreover, used in tropical countries as an article of food. In Sumatra they are salted and used in cooking and served at table, and in Western India they are used in preserving or pickling of fish. The leaves partake of the acid property of the fruit, and a decoction is employed in Ceylon for fomentations and in ophthalmic cases; they are, moreover, taken internally for the cure of jaundice. In Bengal an infusion is made from them, and used in preparing a fixed yellow die, in which silks, after having been previously dyed in indigo, are dipped and changed to a green.

The tamarind-tree is said to exhale a large amount of acid, and the damp air becoming impregnated with it during the night, sensibly injures the fabric of cloths exposed to its influence for any length of time. On this account the natives have a strong objection to sleep under the trees. It has been said that no plants will grow under the shade of the tamarind; but this is evidently a mistake, though it is not impossible that the acid has an injurious effect on some plants. The flowers are employed in Ceylon in the preparation of a confection which is considered valuable in liver complaints.

The seeds, in times of scarcity, are eaten as food, being first roasted and then soaked for some hours in water, by which the hard outer skin is removed; they are afterwards boiled or fried and eaten. Simply pulverized, they are mixed with water into a thick paste, and applied to boils to promote suppuration. The powder is also boiled with thin glue, and is said to constitute one of the strongest of wood cements. Besides all these various uses of the tamarind-tree, it is said that the native silversmiths in Southern India use a strong infusion of the acid fruits, mixed with sea salt, for cleaning and brightening silver.

M'Boundou, or Icaja, an Ordeal Poison used at the Gaboon. M M. Rabuteau and Peyre. (*Comptes Rendus* lxxi., 253.) In 1869, one of the authors brought from the Gaboon some roots of m'boundou. They had been dug up by himself from a humid soil in the vicinity of the river Como, about thirty leagues inland. It is only with great difficulty that the plant is obtained in the settlement. The places where it is to be found are kept secret with such care by the fetishmen from Europeans, and even from the natives, that up to the present time only a few specimens have been obtained, which have not been sufficient to enable a complete study of its toxic properties to be made.

The roots with which the experiments were made measured at the crown, the largest three centimetres in diameter, the smallest about one. They are sometimes found of a larger size. The length varied between fifty and seventy centimetres. The rather thick bark is, both when fresh and when dry, reddish at the surface and of a bright red colour under the epiderm. The wood which it covers is greyish-white and very hard.

The experiments were nearly all made with the bark,—some few, however, with the root-wood,—from which aqueous and alcoholic extracts were prepared. The bark and the wood are both very bitter, their infusions, even when very much diluted, possessing still an extreme bitterness. Treated with a solution of iodine and iodide of potassium, or with phosphomolybdic acid, they gave an abundant precipitate. They contain an alkaloid (perhaps many) which is believed to be the same in the bark and in the wood, since the effects observed upon animals have appeared identical, the only difference noted being that the alcoholic extract has seemed more active than the aqueous extract. A difference, though but a slight one, has been noticed in the effect of the poison when introduced into the stomach from that which follows it when introduced under the skin of animals.

After many experiments made with varied doses of the poison upon frogs, rabbits, and dogs, it is believed that the following is the manner of action of the poisonous principle of m'boundou.

Introduced in a very small quantity under the skin of a frog the poison produces only a constraint of the movements,—a sort of paralysis,—which prevents it from jumping except with difficulty. The same effect was observed when, instead of introducing the extract, which is very powerful, under the skin, a little powdered root has been substituted for it. When only a small quantity of the aqueous extract has been introduced under the skin, its effect disappears completely after about an hour.

A dose of three milligrammes of this extract injected under the skin of a frog produces at first the constraint of movements just noticed, but after ten minutes or more it suffers from shocks and tetanic convulsions. These convulsions are not produced spontaneously in general, but are brought on by touching the animal, or simply striking the table upon which it rests. If the dose is stronger—one centigramme, for example—the convulsions appear more quickly; there is rigidity, but it is rarely that the animal can be raised altogether as when one is poisoned by strychnine. There is always a certain relaxation compared with what is observed in the action of strychnine. Moreover, the frog is not rigid after death. This occurs after a period not exceeding three-quarters of an hour, unless the dose has been feeble; in that case the animal, placed in water, recovers completely after a few hours.

If a frog be prepared according to the method of M. Claude Benard, by tying the lower part of the trunk and excluding the lumbar nerves, then, by introducing the extract under the skin, it is ascertained that m'boundou acts upon the spinal marrow. It is not a muscular poison.

A dose of ten centigrammes of the extract of m'boundou in aqueous solution injected under the skin of a rabbit in two or three different places, in order that the absorption should be more rapid, killed the animal in twenty minutes. Five or ten minutes after the injection, upon being touched, it suffered from energetic starts and shocks that may be compared to electric shocks; at the same time the movements of its limbs, especially of its posterior ones, were much impeded. It died from asphyxia, but its life might have been prolonged by artificial respiration. The same dose injected in another rabbit at a single point did not cause death: at the end of two hours the animal had but feeble shocks upon being touched, and

even these disappeared totally. It ate with appetite. This fact proves evidently that the elimination of the poison is rapid.

Fifteen centigrammes of the same extract dissolved in thirty or forty grammes of water, and introduced into the stomach of a rabbit, caused its death at the end of an hour and five minutes. The symptoms, which were the same as the preceding, commenced to manifest themselves ten minutes after the introduction of the poison. With a dose of forty centigrammes the effects were startlingly sudden.

The symptoms observed in dogs were of the same kind, appearing generally, according to the dose, at the end of five or ten minutes. When their appearance was tardy they were easily provoked, as in the case of the rabbits, by raising the animal or simply touching it. As before, the shocks were powerful, the breath was panting, the posterior limbs were paralysed. The uncertainty and difficulty of the movements were more apparent when the aqueous solution of the extract was introduced into the stomach than when it was injected under the skin. A dog which had been made to swallow twenty-five centigrammes of extract dissolved in forty grammes of water called to mind the bar that the Gaboonese wish those who have taken the ordeal beverage to jump over. This animal, sensible to caresses and obeying the voice, could not clear steps eighteen centimetres high. Every time that it made an effort it trembled, and suffered violent tetanic convulsions. At the end of an hour it was still convulsed, even under the influence of fear; but an hour later, that is, two hours after the injection of the poison, there only remained a slight stiffness in its movements, and it ate with good appetite. Its ears and muzzle, which had been hot before, became cool.

A dose of forty centigrammes of extract introduced into the stomach of a dog caused death in twenty minutes. It died of asphyxia, accompanied by convulsions; its sphincters relaxed, causing an emission of urine and fecal matter. A nasal hæmorrhage was observed, which hæmorrhage has also been noticed among the Gaboonese. Rigidity did not set in until about three-quarters of an hour afterwards.

Upon considering these facts, it appears that the active principle or principles of m'boundou produce effects which present a certain analogy with those produced by strychnine, but differ considerably from them under certain aspects. These effects resemble rather those of brucine; but it is remarked that m'boundou did not produce that hoarseness of voice in the dog experimented upon which,

contrary to what is generally admitted, the authors have remarked in dogs to whom brucine has been given by them.

M'boundou is an extremely rapid poison; but the experiments tend to show that it is quickly eliminated from the system, and that fatal symptoms may be allayed by artificial respiration.

Some researches upon m'boundou were made in 1861 by MM. Pécholier and Saintpierre.* These experimenters had but a small quantity of root at their disposal; they nevertheless observed the greater part of the symptoms above noted. But the authors cannot agree with them that the poison, after having produced tetanic convulsions, leads to insensibility, paralysis, and death. The restraint of the movements was noticed by them first, death occurring in the midst of convulsions.

Detection of Adulterations in Copaiva Balsam. Dr. H. Hager. (*Ph. Cent. Halle*, 1870, 296.) The author has met with copaiva balsam adulterated with oil of sassafras. The adulteration is detected in the following manner:—1 c. c. balsam and 2 c. c. concentrated sulphuric acid are mixed; after the mixture has cooled, 20 c. c. alcohol are added, the mixture is heated to boiling, and then set aside. If the balsam be pure, after the addition of the alcohol, a milky grey yellowish or pale reddish yellow liquid is obtained, which on boiling becomes yellow, clear, and transparent, a resinous compound settling to the bottom. If adulterated with oil of sassafras, the addition of alcohol produces a dark brown-red colour, becoming after boiling much darker, with a tint of violet, similar to the juice of black cherries.

Oil of turpentine, which is probably rarely used as an adulterant, is readily detected by heating slightly two to four drops of the balsam, dropped upon bibulous paper, in such a manner that no visible vapours are evolved. Oil of turpentine evaporates first, and is recognised by its odour.

This test is unreliable if Venice turpentine is used for adulteration. The author invites experiments with the following test, which has given him reliable results: 5 or 6 drops of water and 5 to 7 c. c. balsam are mixed in an evaporating-dish with sufficient levigated litharge to form a thick semi-liquid mass. At a temperature of 20° to 25° C. (68° to 70° F.), a well-marked turpentine odour is given off, if the balsam contains but 10 per cent. Venice turpentine, and even 5 per cent. may still be recognised.

An approximate quantitative estimation of the adulteration may

* *Journal d'Anatomie et de Physiologie*

be made as follows:—5 grams balsam, 8 to 10 drops water, and 15 grams litharge, are heated for a quarter of an hour in a sand-bath, then for several hours in a water-bath. After cooling, the hard mass is rubbed to powder and boiled with benzin, the liquor evaporated, and the residue macerated with 90 per cent. alcohol for several hours. The alcoholic filtrate evaporated to dryness, leaves about 0·2 to 0·3 resin, which when boiled with solution of potash, yields a filtrate which is scarcely tinged by sulphide of ammonium. In the presence of turpentine, however, this last residue contains about three-fourths of the resin of the adulterant, and yields with potash a liquid in which sulphide of ammonium produces a bulky brown-black precipitate. The lead compound of the resin of turpentine is soluble in benzin and alcohol, but not the corresponding compound with the resin of copaiva.

Tests for the purity of Bitter Almond Oil and Oil of Cloves. F. A. Flückiger. (*Pharm. Journ.*, 3rd series, i., 321, from *Schweiz. Wochenschr. f. Ph.*) Since the foundation of the anilin dye industry, nitro-benzol, or oil of mirbane, has become a readily obtainable substance, costing no more than one-twentieth as much as the true bitter-almond oil, which it resembles in many characters. For some purposes there is, in reality, little more reason for objecting to the use of nitro-benzol than to the use of crude bitter-almond oil containing prussic acid. Existing toxicological experience has proved nitro-benzol to be a narcotic poison, though it is scarcely more dangerous, on the whole, than bitter-almond oil.* Every now and again the problem of distinguishing these two liquids comes forward in pharmaceutical literature, and for that reason the author deems the publication of the following remarks to be appropriate.

There is no difficulty in distinguishing between bitter-almond oil and nitro-benzol, when these substances are pure and unmixed. The specific gravity of bitter-almond oil is from 1·04 to 1·044, or at the utmost 1·075:† that of nitro-benzol is 1·20 to 1·29, so that Wagner has based on this difference a method of determining the amount of nitro-benzol in bitter-almond oil. If at the same time advantage be taken of the solubility of the aldehyde in a solution of bisulphite of soda, it is possible to effect an approximatively accurate separation of bitter-almond oil from nitro-benzol, leaving prussic acid out of account.‡ However, it is but seldom that a quantita-

* Compare Husemann, Supplement to the "Handbuch der Toxicologie," 1867, p. 118.

† Gmelin, "Handbuch," vi. 15.

‡ Wagner; Fresenius: *Zeitschrift für Analyt. Chem.*, v. 286.

tive determination is needed; more frequently the mere detection of nitro-benzol is alone requisite, and this must be attempted before the application of Wagner's method, by means of some characteristic reaction. Nitro-benzol may be readily recognised by diluting it with alcohol, leaving it in contact with zinc and hydrochloric acid, and when the evolution of gas has ceased, supersaturating with potash, and producing the colour reactions of anilin. It is evident that this method would be applicable for detecting nitro-benzol in bitter-almond oil as well as in other liquids; and although it has come into use, the author found a want of any statement as to its delicacy, and for that reason he undertook the following experiments. He finds it is not necessary to add alcohol, nor to separate the anilin formed, unless very great accuracy be required. The test is applied as follows:—granulated zinc is covered with dilute sulphuric acid (1.11 sp. gr.), adding the oil to be tested, and shaking up well; after about two hours the watery part of the liquid is to be poured on a moist filter. When heating has been prevented, the filtered liquid is colourless.

On adding to a small portion of the filtrate a few grains of chlorate of potash, a violet colour is produced, or, with small quantities of anilin, a red colour. The chromate produces a blue colour that soon passes into red, brown, and dark green; perchloride of iron gives a red colouration. The action of chromate is very delicate; but the chlorate is to be recommended as cleaner. If the latter salt does not react at once, a drop of concentrated sulphuric acid must be added, and the tube left for an hour or so.

By this very simple test 1 per cent. of nitro-benzol may be detected with certainty in bitter-almond oil. The reactions are obtained also, when only 1 or 2 grms. of oil containing 1 per cent. of nitro-benzol is operated upon with 10 grms. granulated zinc, and 10 grms. dilute sulphuric acid during one or two hours. Very intense colourations are produced when the nitro-benzol in the oil amounts to 5 per cent.

However, it is not absolutely necessary to use hydrogen, or acids for producing it, in order to convert nitro-benzol into anilin. If bitter-almond oil containing nitro-benzol be mixed with finely-divided iron or zinc, and the pasty mixture exposed to a temperature of 100° C. in a closed vessel for some hours or days, the formation of anilin takes place. It is facilitated by the addition of a little alcohol. Afterwards the mixture is diluted with some alcohol and filtered, the solution containing the ethereal oil and the anilin is mixed with some dilute sulphuric acid, so as to obtain sulphate of anilin in solution for testing.

Pure bitter-almond oil treated in this way does not give any colour reactions. When the action of metallic iron or zinc upon the oil has been continued too long, the filtrate obtained after addition of sulphuric acid is rather brownish, but even then chlorate of potash would not produce any blue, red, or green colouration, if there were no nitro-benzol present.

Lastly, the author remarks, that although the addition of a well-adjusted mixture of alcohol and nitro-benzol to bitter-almond oil, would not affect the specific gravity, still five or ten per cent. of spirit would be indicated by the action of fuming nitric acid. Equal volumes of true bitter-almond oil and of this acid mix together without disturbance, while the presence of alcohol would give rise to a violent reaction.

Oil of cloves is so well characterized by its chief constituent, and is at the same time so cheap, that it is not likely to be much adulterated, unless it be with carbolic acid.

If the acid be combined with bases, most of the ethereal oils that might have been added as adulterants would be recognisable by the smell they give to the remainder of the oil of cloves. Fat oils would show their presence by reduction of the specific gravity, and, excepting castor oil, by the reduced solubility in alcohol, which dissolves pure oil of cloves in all proportions. In order to detect carbolic acid, the author suggests the following test:—Shake from 2 to 10 grams of the oil to be tested with 50 to 100 times as much hot water, and after cooling, pour off the clear liquid. Add to a portion of this liquid a drop of ammonia, and then a pinch of chloride of lime. If the oil of cloves contain carbolic acid, the liquid then acquires, on shaking, a greenish colour that passes into blue, and lasts for some days. Pure oil of cloves does not give this reaction. If it be desired to apply this test very delicately, the liquid may be gently evaporated to a small bulk at a moderate heat.

Ginseng. John R. Jackson. (*Pharm. Journ.*, 3rd series, vol. i., p. 209, from *Gardeners' Chronicle*.) Amongst the most extraordinary medicinal plants which have from time to time been celebrated in different ages and countries, the ginseng of the Chinese is one of the most curious. This drug is the dried root of *Panax Schinseng*, Nees, a small plant, frequently with a creeping underground stem or rhizome. It is a native of China, and so highly is it esteemed, that it forms a large article of internal commerce, and realises almost fabulous prices. As much as 300 taels of silver, which is equal to about £100 of our money, is about the average price of a single tael (640 grains) of the drug. Though it has been

proved by our own chemists to possess no medicinal virtues, other than being mucilaginous, aromatic, slightly bitter, and saccharine, it is nevertheless esteemed as a most invaluable root by the Chinese, who believe it produces the most extraordinary effects upon the human system, invigorating and restoring the fatigued and wearied body to a marvellous degree, and bringing back youth to the aged and strength to the weak. Be this as it may, it has held its position with the Chinese for a very long time, and still continues to be highly prized. The Chinese name, jinsang or ginseng, implies "wonder of the world," and the generic name *Panax* is derived from the Greek *panakes* or *panacea*, a cure for all diseases. Both words, therefore, refer to its supposed extraordinary powers. The ginseng plant grows in the mountainous parts of China; but the best quality, or that which is most esteemed by the Chinese, is obtained from the Corea; Manchuria also produces a good variety. A species of *Panax* named *quinquefolia*, growing in North America, has roots similar to those of the true Chinese ginseng, with which plant indeed it is often confused. These roots are, however, on comparison, more slender than those of *P. Schinseng*. The Americans at one time exported them to China in large quantities as a substitute for the Chinese drug.

The author quotes some interesting remarks on the trade and cultivation of ginseng, from a report of the Commissioner of Customs of Newchang.

Eucalyptus globulus ; its use in Medicine. (*Pharm. Journ.*, 3rd series, i., 156, from *Phil. Med. Rep.*) Dr. Lorinser, of Vienna, gives the results of a number of observations made regarding the effect of a new remedy for intermittent fever. The remedy is the tincture of the leaves of the *Eucalyptus globulus*, a plant of the natural order *Myrtaceæ*. In 1869, Dr. Lorinser made some experiments, the results of which he published; but he was brought to a standstill by the want of a supply of the medicine. The plant has since been cultivated by Herr Lamatsch, an apothecary; and a sufficient quantity of tincture has been made from the leaves to supply a number of medical men in the districts of the Theiss and Danube, and in the Banat. The records of fifty-three cases of intermittent fever in which the eucalyptus was administered have been communicated to Dr. Lorinser, and he gives very brief outlines of each, with the following summary of the results obtained. Of the fifty-three patients, forty-three were completely cured; in five there was relapse in consequence of a failure of the supply of the tincture of eucalyptus, and quinine had to be employed; two of the cases were not true

ague; in one, the medicine (as well as other remedies) was vomited; and in one the patient would not allow the treatment to be continued. In eleven of the cases, quinine had been used without effect; and nine of these were cured by the eucalyptus. There was return of the fever in ten cases, at intervals varying from one to four weeks; in five of these quinine had to be used, in consequence of there being no tincture of eucalyptus, and in the other five the eucalyptus was successfully employed. The tincture is said to be easily made, and to have a pleasant aromatic taste; it acts favourably on the digestive organs. Dr. Lorinser believes that in it we have a valuable remedy for intermittent fever. It may be so; but, considering the comparative failure of the substances which have hitherto been recommended as substitutes for cinchona and quinine, still more extended and careful observation will be necessary before recognising the claims of the *Eucalyptus globulus* to rank as an antiperiodic on which dependence can be placed. The districts which Dr. Lorinser has chosen for testing the effect of the remedy are, we believe, well-fitted for the purpose—intermittent fever being very prevalent in them.

The Rev. M. J. Berkeley mentions in the *Gardeners' Chronicle*, on the authority of a letter received from Cannes, that Dr. Gimbert has introduced a new method of dressing wounds by using eucalyptus leaves in the place of lint. The leaves, which have a "catty" smell, are merely laid on the wounds. The balsamic nature of them not only cures, but after a few hours all the unpleasant odour of the matter ceases.

In the "Year Book of Pharmacy," 1870, p. 126, will be found an account of some interesting researches by M. Cloez, on the essential oil obtained by distillation from the fresh leaves of *Eucalyptus globulus* gathered in Paris. This oil is now being introduced into use in perfumery by Mr. Rimmel. It consists chiefly of eucalyptol, a liquid body, in chemical characters resembling camphor, of which it appears to be a homologue, two steps higher in the series.

The Guava. (*Pharm. Journ.*, 3rd series, i., 605, from *Drug. Circ.*) The guava is a tree which grows in tropical countries, and it is found principally in the West Indies. It is of the genus termed by botanists, *Psidium*, and is of two sorts, the *P. pomiferum* and *P. pyriferum*. The plant does not attain any considerable size, being generally about fifteen feet high, and it is of very delicate formation. The bark is quite thin, and of a light brown colour. It peels off in small portions, when exposed to the sun; to prevent this, the trees

are usually planted beneath others of a larger growth and hardier nature. The leaves are of an elliptic, lanceolate form. They are very distinctly marked by the fibres of which they are composed; they are of a dark green colour, and measure about $2\frac{1}{2}$ inches. The flowers resemble those of the orange, and emit a strong perfume; the fruit is about the size of a small lemon; it is almost of the same shape and colour. The interior consists of a red pulpy substance, containing an innumerable quantity of small seeds somewhat larger than those of the fig. The rind of the fruit is of the consistency of that of an apple. Of this fruit the West Indians make several kinds of preserves,—the guava jelly, stewed guava, quake pear, and marmalade; the most lucrative is the guava jelly; the fruit is often eaten in its raw condition. The negroes are so fond of it that they are very wary and diligent in guarding the trees from robbery when they are bearing fruit. The guava jelly is obtained by boiling the guavas with sugar and spices; and, after expressing the juice through a cloth, it is left to cool. Of course it undergoes minor processes which it is unnecessary to describe.

The jelly is frequently bottled, but oftener it is put into small cylindrical boxes made of laminated pine board. A great quantity of this comfit is manufactured in Cuba, where it is termed "*Jalea de guayaba*," which is exported to the United States and Europe. Notwithstanding that a good deal is made in the smaller islands, they import quite a quantity of the Cuban jelly.

After the juice has been expressed from the guava, there remains the skins and the pulp containing the seeds; the latter is stewed and bottled, and it constitutes the stewed guava. This is generally partaken of with milk.

The skins are converted into the delicacy termed "*quake pear*," by a process varying slightly from the foregoing.

The guava marmalade is not frequently made. It consists of the guava grated and prepared in a peculiar manner.

Of the before-mentioned preserves, the marmalade is preferred by most connoisseurs. The small seeds in the stewed guava are very objectionable, the more so if one is subject to toothache, as they get into the cavities of decayed teeth, causing a great deal of suffering.

The natives of the West Indies are great herbalists; they convert almost any plant into medicine of some kind or other, and they have discovered several medicinal properties in the guava-tree and its complementary portions.

There is no distinction made between the name of the tree and that of the fruit in English, both being guava; the French term the

tree *goyavier*, and the fruit *goyave*. Their respective terms in the Creole patois are *gyanbaum* and *gyan*.

Monordica Elaterium. Dr. Köhler. (*Virchow's Archiv. Bd.*, iv., p. 3; 1870.) The activity of the juice of this plant is dependent on the presence of elaterin, which is a chemically indifferent substance analogous to the resins, and incapable of forming salts with either acids or bases. The cause of the violent purgative action of such indifferent substances as elaterin, and the analogous compounds obtained from the *Convolvulaceæ* and *Guttiferæ*, has up to a recent period been involved in much mystery. Some clue to an explanation has, however, been obtained from the experiments of C. M. G. Zwicke on the action of convolvulin and jalapin, from which it would appear that the activity of these resins is due to their solution in the bile. Hagentorn also found that when convolvulin had been converted into a soluble convolvulinic acid it still was incapable of producing any drastic effects in cats when rubbed into the skin, or applied to the mucous membranes of the nose, mouth, or stomach, or introduced into the jugular vein. He even found that the resin might be introduced into a loop of the small intestine, the contents of which had been expressed and a ligature placed upon it, above and below, without producing vomiting or purging after twenty-four hours' stay, though the mucous membrane was reddened. Untiedt continued Hagentorn's experiments, and satisfied himself that convolvulins of the alkalies, when subcutaneously injected or introduced into the jugular vein were inoperative. He then employed the rectum as the place of application, and found that whilst clysters of pure convolvulin, or of convolvulin and taurin, or of convolvulin and choloidinate of soda, were quite inoperative, a mixture of convolvulin and bile, or of convolvulin and glycocholate or taurocholate of soda, immediately occasioned violent diarrhœa. On the addition of soap, the purging followed in four hours; and Untiedt has shown, and his statements have been corroborated by Bastgen, that in the latter case a partial conversion of convolvulin into convolvulin-oleic acid occurs. From these experiments it appears that bile, biliary acids, and soap constitute a menstruum for these resinous compounds, and their purgative action is due to the local irritation the solution in the intestinal juices excites, which solution is materially aided by the bile. Dr. Köhler gives the details of a considerable number of experiments he has himself undertaken, and demonstrates that the drastic cathartics may be divided into two, or perhaps even three, classes:—namely, first into those that are not dependent for their activity on the presence and solvent action of the bile: the

former including aloes, croton oil, rhubarb, senna, etc.; the latter being again divisible into those which, on being dissolved by the bile, act purely locally, as jalap, scammony, gamboge, agaricus; and those which, after solution in the bile, not only act locally, but are also absorbed in the blood, and act also on the nervous system: this group including the Cucurbitaceæ, as elaterium, colocynth, and bryony.

Cinchona Cultivation. One of the most important facts observed in the cultivation of the *cinchonæ* recently is the hybridization occurring amongst certain species. This fact is doubtless destined to have a most important bearing on the whole subject, as by this means some of the difficulties at present experienced in the rearing of the more valuable but delicate species, by crossing them with the hardier ones, will be overcome. At a meeting of the Linnean Society held last year a paper on this subject, by Mr. Broughton, chemist to the Madras Government, was communicated by Mr. Howard. Mr. Broughton stated that in the Madras gardens young plants were growing which appeared to be hybrids between *C. succirubra* and *C. officinalis*. In Java also something similar has occurred between *C. Calisaya* and *C. Pahudiana* (= *C. Hassnarliana*, nov. sp. Miq.). Dr. de Vrij says (*Pharm. Journ.*, 3rd series, i., 118):—"The *Calisaya* of Java contains, besides quinine and cinchonine, very often quinidine. The *C. Pahudiana* contains, besides quinine and cinchonine, almost always cinchonidine. In the hybrid of these two I found no quinidine, but cinchonidine and quinine. As the total amount of alkaloids was small, I was unable to ascertain the presence of cinchonine." The discovery will doubtless prove of great importance, for by this means the more delicate but valuable alkaloid species can be crossed with those that are more hardy but less valuable; and thus valuable and hardy plants will be obtained.

CINCHONA IN VENEZUELA. (*Pharm. Journ.*, 3rd series, i., 66, from *Bol. Soc. de Cien. de Caracas*, No. 7, 1870). The *Cinchona rotundifolia* of Pavon (*C. cordifolia*, B.; *rotundifolia*, Wedd.) which yields the Ashy Crown Bark, has been rediscovered in the neighbourhood of Caracas, by Dr. Ernst, the President of the Society of Natural and Physical Sciences of that town. Dr. Vargas discovered the plant in the same locality in 1829.

In an excursion made by Dr. Ernst, the trees were found in groups on the slopes of Papelon, Anauco, Galipan, etc., at an elevation of 4500 feet above the sea-level. The trees were covered with lichens (the *Graphis sulcata*, DC., being particularly noticed), and the largest of them had a circumference of 83 centimetres. The

same tree is said probably to occur in Mariches, from whence small quantities of bark were collected for exportation some time ago. The bark of the tree is known in commerce as Ashy Crown Bark, one of the Loxa or Crown Barks, and occurs in quills. From an analysis made by the Señor Vicente Marcato, a member of the same society, 60 grammes of this bark yielded 3 decigrammes of quinine, and 4 decigrammes of cinchonine. The bark, however, was collected at the wrong season.

From Port Cabello another bark, known as Quina Maracaibo, is exported. This is the produce of the *Cinchona Tucujensis*, a tree growing only to the height of 12 to 15 feet, which is found in the forests surrounding the colony of Tovar. In the same forests are found *Cinchona* (now *Buena*) *Henleana* and *Moritziana* of Klotzsch.

CINCHONA IN NEW GRANADA. Mr. Howard has described and figured in the *Bulletin de la Société Botanique de France* (séance du 13 mai, 1870), a new species of *Cinchona*, from the province of Ocaña, in New Grenada, which he names *C. rosulenta*, Howard (sp. nov.). The specimens were collected by W. Purdie, in October, 1845, who was collecting for the Royal Gardens of Kew in the West Indies and New Grenada, and whose notes on the first part of his travels were published during the year 1844-6, in the *London Journal of Botany*. The plant was collected in the mountains about Velez, in the province of Ocaña, the vernacular name given to it being *Quina de la tierra fria*."

In the appearance of the leaves it comes near *C. ovala* of Pavon, but the nerves are somewhat more prominent and rigid. The bark in appearance approaches *C. succirubra*, but has a more roseate hue, and the surface is marked with small depressions. In chemical composition it resembles the red bark.

Mr. Howard has identified his species with the "*Quinquina rosé d'Ocaña*" of Delondre, which was so named and figured by that author in his admirable "*Quinologie*," the bark at that time just making its appearance in French commerce. It is also identical with M. Rampon's "*quinquina à quinidine*," described in Dr. Planchon's "*Des Quinquinas*," p. 29 (an English translation of which has been published), and also with Dr. Wittstein's "*Pseudo-regia*."

In this paper Mr. Howard has done good service, clearly pointing out the synonymy of this bark, which under the name of *Quina rosé* has long been known in French commerce.

CINCHONA CULTIVATION IN MARTINIQUE. Mons. Belanger, the Director of the Botanic Gardens in that colony, has published

(Paris, 1870) the results of his experiments on the cultivation of the *Cinchona* there.

In 1862, having obtained some cinchona plants, he began their cultivation, in order to test whether they could be successfully acclimatized in that colony. He finds that, though he has not been able to command all the elements of success desirable, yet he has experimented sufficiently to convince himself of the success of the scheme, if the French Government would undertake it. At present there are growing in Martinique plants of *C. Calisaya*, *C. lancifolia*, *C. officinalis*, *C. succirubra*, and *C. Pahudiana*,—altogether 90 in number, and ranging from half a metre to $3\frac{1}{2}$ metres in height. Bark of three years' growth has been submitted to analysis, and said to yield very fair results.

CINCHONA CULTIVATION IN JAMAICA. Very favourable reports have been given of the cultivation in Jamaica. A large number of plants of *Cinchona succirubra* have been raised from seed ripened in the island, the success being sufficient to admit of efforts being made to extend the cultivation.

CINCHONA CULTIVATION IN MEXICO. (*Pharm. Journ.*, 3rd series, i., 146.) Mr. Hugo Finck, Vice-Consul of the North German Confederation at Cordova, Mexico, in a letter to Mr. Hanbury, writes (July 6, 1870) thus of the cultivation in Mexico:—

* * “You remember sending me some seeds of *Cinchona officinalis*: I sowed them and a good many germinated, but the plants were all lost save one. That plant is now 7 feet high, and looking very healthy. Afterwards I got from Mr. Nieto about a hundred small plants of *C. Calisaya*, *C. succirubra*, and *C. Condaminea*, which are all growing amazingly well. Some are already 12 feet high, with leaves from 10 to 15 inches long and wide in proportion. One three-year-old plant flowered at the house of Mr. Nieto, but I think this was premature and caused by some impediment in the ground, as a large stone or some other obstruction with which the roots came in contact.

“In 1866, the late Emperor Maximilian obtained some cinchona seeds from England which he distributed in this country. Mr. Nieto got the largest share of those seeds, and as he took great pains with them he raised thousands of plants, which he distributed to a number of persons. Of these plants the greater part were lost through injudicious management, so that actually only about 300 are alive, of which number I possess one-third.”

CINCHONA CULTIVATION IN JAVA. (*Pharm. Journ.*, 3rd series, i., 76, 342, 441, 466, 544.)

The high value always placed on the curative properties of the quinine barks, has made the medical world anxious to secure continuous supplies, and the fears excited by the testimony of Weddell, Delondre, and other travellers of the reckless destruction of these trees by the cascarilleros, or bark-gatherers, have directed attention to the desirability of cultivating them, so as not to be dependent on native sources, which may one day fail. The Dutch Government, through the representations of Reinwardt, De Vriese, Blume, Mulder, and others, gave their attention very early to this subject. Dr. De Vriese, who took a warm interest in Economic Botany, fortunately obtained, in 1851, a plant of *Cinchona Calisaya*, in Paris, which he dispatched to Java. This plant had been raised from seed collected in South America by Dr. Weddell, and became, in Java, the stock of a numerous offspring.

In the same year, also, Mr. Phud, the minister of State for Holland, dispatched Dr. Hasskarl to South America, to collect live plants and seeds of valuable species. Dr. Hasskarl landed at Callao, in Peru, in December, 1852, and, after an arduous journey and much opposition, obtained plants and seeds of some *Cinchonæ*, chiefly of *C. Pahudiana*, Howard, at first mistaken for the *C. ovata*, Weddell.

He arrived in Java with his collection in December, 1854, and together with Dr. Teijsmann, the Director of the Buitenzorg Gardens, began the cultivation. Unfortunately, the site chosen for this operation was one having only about 6 inches of soil, and when, in 1856, a scientific staff was appointed, the plantation was not in a very successful state. The new director, Dr. Junghuhn, had associated with him Dr. J. E. de Vrij, a chemist well known for his abilities, and eight overseers. Only seventy plants were found of any value, and the plantation was removed to a more favourable situation, and while under Dr. Junghuhn's management, much better results were obtained.

Mr. Van Gorkom, the present Superintendent, reports, that there are now under cultivation in Java, 840,653 plants of *Cinchona Calisaya*, 39,512 of *C. succirubra*, 159,149 of *C. Condaminea*, 812 of *C. lancifolia*, and 409 *C. micrantha*. Of *C. Pahudiana* no number is given; the last estimated number was 900,000, but its cultivation is not now particularly attended to, as it is generally agreed to be of little value.

Though the past history and present position of *Cinchona* cultivation in Java is not all that one could desire, yet it must be remembered that the cultivation of the *Cinchonæ* is fraught with manifold and

various difficulties, and requires an almost delicate adjustment of light and shade, heat and elevation. Mr. Van Gorkom is very sanguine of the future success of the undertaking. He says that courage should be derived "from the certainty that we are on the right path, and indulge in the well-founded hope that the persevering efforts of successive Governments—efforts which have aroused a sympathetic feeling in the educated world in general, and amongst scientific men in particular—will end in glorious success."

Some months ago several bales of cinchona bark were imported into Holland from the Dutch plantations in Java. Samples of this bark have been sent out by the Handels-Maatschappij in sealed packets, with the analysis of Professor Gunning. Herr Jobst in a paper in the *Neues Jahrb. f. Pharm.*, xxxiv., 18, describes this bark as consisting of larger pieces than the first samples sent over in 1867 from the English plantations in the Himalayas, although in both instances there was a want of that fine character presented by the older bark from the Andes as regards colour. He gives the following results of his own chemical examination:—No. I. T. P. King's Bark. Containing, according to Professor Gunning, when dried at 100° C.—

Alkaloid soluble in ether . . . 3·5 p. c. (much quinidine).
 „ insoluble „ . . . 2·0 „

This sample consists of single and double quills from 2 to 7 inches long, from the size of a goose-quill to $\frac{1}{4}$ an inch in diameter and about 1 line in thickness. The pieces are mostly of a dull colour, with longitudinal cracks and faintly-marked transverse striæ, covered with warts at some parts, and pale yellow at the interior. Herr Jobst found it contained in all 3·2 per cent. of alkaloids, much of which was conchinine and cinchonine, only a trace of quinine and no quinidine, but an amorphous basic substance that has not yet been examined.

Nos. II. and III. T. P. King's Bark. Containing, according to Professor Gunning, when dried at 100° C.—

Alkaloid soluble in ether . . . 2·1 p. c. (little quinidine).
 „ insoluble „ . . . 1·3 „

This sample consists of fine, uniform quills of a grey colour, covered here and there with lichens. The quills were 7 inches long, from 5 to 6 lines diameter and about 1 line in thickness. The cracks and striæ was scarcely recognizable, and the colour of the bark inside was pale or dark yellow. The total amount of alkaloids was 3·5 per cent., consisting of 1·7 quinine with some quinidine, conchinine, cinchonine, and amorphous basic substance.

No. IV. M. Containing, according to Professor Gunning, when dried at 100° C.—

Alkaloid soluble in ether . . . 1·1 per cent.
 „ insoluble „ . . . 0·9 „

This consisted of grey, greyish-brown, and brown quills, and flat pieces about 8 inches long, with longitudinal cracks, but no transverse striæ: reddish-yellow inside. It contained in all 1·9 per cent. alkaloids, including 0·5 quinine, besides cinchonine, some quinidine, conchinine, and amorphous base.

Brown Java bark. Total amount of alkaloids 1·2 per cent., chiefly quinidine and amorphous base with trace of quinine, but neither cinchonine nor conchinine. This bark (*Pahudiana*) is already well known to be worthless, and the Dutch Government has forbidden its production.

These results show that only two of these samples (Nos. ii. and iii.) contain any sensible amount of the alkaloid that is alone of use, —crystallizable quinine; and in regard to this the samples are nearly the same as a very ordinary sample of Calisaya bark. Consequently the Java bark, as produced at the present time, is quite unfit for the manufacture of quinine.

On this article, Dr. de Vrij remarks, that Professor Gunning calls Delondre and Henry's alkaloid quinidine: whereas, Herr Jobst uses the name conchinine, given by O. Hesse about two years ago; and also gives to the alkaloid, called *cinchonidine*, the name of quinidine. These departures from established usage being not only reprehensive on the ground of causing confusion, but also an infringement of the laws of priority.

Unfortunately there have been great diversities on the question of the proper mode of cultivation, and the species likely to give the best result, owing, in a great measure to the presence of some amount of party spirit, thus rendering the access of reliable information very difficult. A *resumé* of the whole question has been given by Mr. J. E. Howard in the *Pharm. Journ.*, 3rd series, i., 441. He writes as follows:—

Many persons feel a deep interest in the introduction of the cinchona-trees into the regions of the East. These will naturally inquire what are the results, as practically ascertained, from the many years of labour and the great expense incurred since the month of April, 1852, when the first plant of genuine cinchona arrived safely at Java; and still more expressly since the 13th of December, 1854, when Mr. Hasskarl (sent out by the Dutch Government to collect seeds) arrived with his precious cargo at Batavia.

The first date was that of the introduction of the *Cinchona Calisaya* from seeds collected by Dr. Weddell* (from some one of its varieties apparently): the latter was the period from which we reckon the acclimatization of quite another species, which seems to have found a more congenial habitat than the first on the mountains of Java. In fact, the propagation of this latter was so easy and rapid that it became soon an object of attention to botanists, and of somewhat anxious consideration. The plants ere long numbered hundreds of thousands, and the possible eventual value of the species, as a source to be relied upon for the production of quinine, was doubtful. At the end of 1863 these plants were reported 1,139,148 against only 12,093 of *Calisaya*, and a few hundreds of other species.

Being unfamiliar to botanists, it was mistaken for the *C. lucumæfolia*, an illusion which I assisted to dispel; and in the year 1860, being engaged in the publication of my "Nueva Quinologia," I received from my friends in Java very ample materials for the description of the species. At the suggestion of those most interested, and as a compliment well deserved by his exertions in the cause of cinchona cultivation, I named it *C. Pahudiana*, after the Governor, M. Pahud, whose term of office was just about expiring. I then pronounced it an inferior species, and expressed my belief that it would prove a source of disappointment to the Dutch Government. From this opinion I have never departed, although I have been willing to follow, with a greater or less degree of expectation, the researches of my friend Dr. de Vrij, whose analysis of the root-bark shows better results than I have been able to obtain from that of the rest of the tree.

It will be understood that I refer to the quinine-producing powers of the species, which seem to me unpromising. In other respects, I have been induced to modify my judgment in a more favourable sense. It is well known that from a therapeutic and pharmaceutical point of view, the value of a specimen of bark does not coincide with the amount of quinine it may contain. Other ingredients, and among them the alkaloid commonly known as *uncrystallizable quinine* (of which this bark possesses a large share), no doubt contribute largely to the medicinal qualities of the bark, and I believe that Dr. de Vrij considers his experiments show that this is superseded by real quinine in the roots. I have found that the bark transmitted by Mr. M'Ivor as that of *C. Pahudiana*, and skilfully prepared by him, attracted the

* Soubeiran et Defondre, de l'Introduction et de l'Acclimatation des Cinchonas dans les Indes Néerlandaises. 1868. Page 27.

attention of a London broker familiar with the article in preference to those of other, and, in my opinion, superior kinds sent at the same time. I have, consequently, taken up a kind of neutral position in the contest which has been waged with fierceness over this plant, even in the Chambers of the Dutch Government. In so doing I have, as is usual, incurred an amount of obloquy disproportionate to the offence, and which is avowedly increased by my having been favoured with so much assistance from my friends in Java, in the way of specimens and of botanical descriptions, as I have fully acknowledged in my "Quinologia." Professor Miquel, in particular, has attacked me personally on the subject, though I have never either seen or had correspondence with him. In my "Quinology of the East Indian Plantations." I expressed myself thus;—"It is extremely unpleasant to come in contact with such a state of things, and I find that I am censured for not being sufficiently one-sided in the dispute. The writer in 'Gids' says, 'Mr. Howard, who described the unfortunate sort as a new species in his noble work on cinchona, although he at first, with reason, brought its usefulness into question, afterwards took a position of weakness and uncertainty as the conflict began to wax warm.' " etc.

To this I have only to reply that I have published such information as came to my hands as correctly as I could, and intend still to do so. I see no occasion to alter my account of the species given in the "Nueva Quinologia," and still believe that it is without value if looked at simply as a source for the extraction of quinine; but as regards the root-bark, I have personally no information to oppose to the favourable estimate elsewhere entertained, and must therefore maintain a position of "uncertainty" till this is removed by those who can decide the question. If the *C. Pahudiana* be looked upon in another point of view, viz., as a possible source of bark for pharmaceutical purposes, I have shown in my reports given to the Government of British India, on specimens from Ootacamund, that the quill bark is not only *not* worthless, but that such quills as those sent by M'Ivor were actually preferred to other kinds sent with them by dealers most competent to judge in London, and this is not without reason, from their taste, appearance, and chemical composition. I cannot, therefore, agree with those who recommended the superfluous labour of cutting down the trees; neither can I rank this plant "among the best sorts of all," as, it seems, some have attempted to do. The trees having now many years' growth, *might perhaps furnish quill bark fit for the home market*; and I shall be surprised if it is not at least equally valued there with the bark of the so-called

C. Calisaya, which, I am afraid, will prove "unfortunate" also, at least if it produces but 1·3 per cent. as described by Van Gorkom.

It will be seen that the above estimate of mine has been fully borne out by experience, but in the meantime I must revert to the learned professor, who, as I am informed by my friends (for he has not sent me a copy of his work)*, says,—

"*Veritati contrarium est*,† quod nuper adhuc exclamavit Howard, a magistratu nostro Indico jussum fuisse arbores ipsas innumera- biles diruere et extirpare" (p. 270).

An extract from the *Official Report* of the Transactions in the Dutch Parliament, of 27 May, 1862 (sent me in the original and in a translation), is as follows:—

Mr. Uhlenbeck, Minister of the Colonies, speaks,—

"And to show the great difference, I communicate that in all the time that the cinchona culture has been performed on a large scale, there have only been planted 7804 cinchona trees which really contain quinine, whilst in the meantime there have been planted 1,029,291 trees (*Pahudianas*) which are only fit for FIREWOOD (*brandhout*)."

Ditto of the session of the Parliament on 2nd June, 1863. Mr. Van Eck, M.P., speaks;—

"The former Minister of the Colonies stated only the trees are fire-wood, we must DESTROY them" (*uitroeijen*, to root out, extirpate, destroy, exterminate).

Professor Miquel also says in the same work:—

"*Tædiosam historiam haud repetam, nec habeo quæ ultro opponam Howardio qui me dissentientem indigne tractavit in plagula quadam diurorum nostrorum mendacem me exclamans.*"

As I never wrote (nor could write) an article in a Dutch newspaper, M. Miquel can only refer to the following extract from a letter of Dr. de Vriese, who died in 1862, and consequently cannot defend himself.

A letter from myself to Dr. de Vrij, published with my permission, contains the following in reference to the determination of the *C. Pahudiana* (Prof. Miquel, contrary to De Vriese, Dr. Weddell, Markham, etc., identifying the plant with *C. Carabayensis*):—

"I sent over to Dr. de Vriese a fine specimen of the plant in ques-

* "*De Cinchonæ speciebus quibusdam adjectis iis quæ in Java coluntur, scripsit F. A. Guil. Miquel, in Annal. Musei Botanici Lugduno-Batavi,*" tom. iv., fasc. ix., p. 263; 1869.

† I have added the *italics* in this and other places to direct the reader's attention. Compare this with the version, "*A magistratu nostro Indico jussum fuisse,*" etc.

tion, with the fruit well developed, given me by Dr. Weddell himself, And in a letter written subsequently, under date 4th November, 1860, Dr. de Vriese says,—The examination and comparison of *C. Carabayensis* and *C. Pahudiana* has shown me indubitably that the two species are different. To maintain a contrary opinion would be a lie."

I proceed to say, "I hesitate to copy the above strong expressions, but they throw light on the subject, as showing there must have existed some excitement of the feelings, connected, no doubt, with the great material interests at stake, which may have interfered with calm scientific inquiry, and led, in Dr. de Vriese's opinion, to erroneous statements."

So far my letter, and I must add that is a very unimportant matter, in comparison, whether these species are identical or (as in my judgment) separate. I had shown in my "Quinologia" their points of resemblance as well as of separation; but it is important that a personal attack, against which I have no opportunity to defend myself, should appear in a work published at the expense and under the auspices of the Dutch Government.

Since the departure of M. Pahud, and the death of Dr. Junghuhn, the cultivation of the plantations has passed under different management, as I have mentioned in the Appendix to my work previously mentioned.

The proportion of plants of different species is now very different. In the second quarter of 1870, according to a paper sent me by Dr. Hasskarl, the plants were as follows:—

<i>C. Calisaya</i> and <i>C. Hasskarliana</i>	1,100,983
<i>C. succirubra</i> and <i>C. caloptera</i> *. . . .	152,782
<i>C. officinalis</i>	222,904
<i>C. lancifolia</i>	43,227
<i>C. micrantha</i>	620

Total 1,520,516

The progress of the cultivation is spoken of in warm and eulogistic terms, and the number of *C. Pahudiana* trees (now grown to a good height) is left out of the account.

It is unfortunate, however, that all has to be tested by practical results, and the favourable analyses at present published, have their

* Probably *C. pubescens*, subspecies *C. Pelletierina*, if the deep green colour attributed to the leaves is correctly represented.

true value brought to light by the price per pound paid for the barks set forth for public sale in Amsterdam.

In the past season there was a pretty large importation of these barks; and samples under the name of *Konings Kina* and *Bruine Kina* were forwarded to this country, where they were examined, but did not meet with much acceptance. A sale has since taken place in Holland, and the results are not a little curious, and certainly worthy of record. The so-called *Calisaya*, or *Konings Kina*, was bought (as I am informed) by a druggist, at about 2*s.* English, with the intention of its being sold for pharmaceutical purposes, and not for the manufacture of quinine. The remainder appears to be *Pahudiana* (but it may perhaps be called *Hasskarliana*), and brought a higher price, averaging about 2*s.* 1½*d.*, English money. I do not think, however, that any manufacturer of quinine would invest his money in this. As far as my information goes, there has been as yet NO PRODUCTION OF BARK FITTED FOR THE MANUFACTURE OF QUININE, with the exception, perhaps, of one sample which resembled both in appearance and in quality one of the *Calisaya légers* of the French (the product, I believe, of the *C. micrantha Calisayoides*, of Dr. Weddell's new classification). It was consequently a poor and very second-rate bark, although the best from Java. The *C. Hasskarliana* of Miquel, is, according to Dr. de Vrij, the result of the interference of the pollen of *C. Pahudiana* with the *C. Calisaya*. Professor Miquel makes it a new species. On this I give no opinion, but I am pleased to see that the *C. Pahudiana*, with its congeners, is proving itself worthy of the character I gave it, as likely to be found useful as a medicine. Of this I have an additional confirmation in the examination of a good-looking sample of bark called *C. Pahudiana*, just brought into the English market from the plantation of a gentleman in Ceylon. This contains a fair proportion both of quinine and cinchonidine, and is likely to prove a good bark for pharmaceutical purposes.

M. Van Gorkom concludes his official report for 1864 with the following words:—"Until now the different reports concerning the cultivation of chinchona have thrown more darkness than light on the subject, and consequently the credit of this great undertaking has suffered."

It would be greatly to the satisfaction of the manufacturers of quinine, if this gentleman would throw light upon the question, what prospect six years of additional experience enables him now to hold out as to any possible supply of their wants from this quarter in the future?

Since this article of Mr. Howard's, a report has been published by Professor Hasskarl, in which, speaking of the cultivation in Java, he says that the weather has been on the whole favourable, and the growth of the plants leaves nothing to be desired. The total number of plants grown from seeds and layers is 1,520,516; of which 1,100,983 are *C. Calisaya*, next in number come *C. officinalis* and *succirubra*, etc., very few *C. lancifolia* and *micrantha*. In addition to these, there are 870,599 transplanted plants, giving in the gross total an increase of 197,699 plants since the commencement of the year. 460 kilograms of the bark were sent to Holland in December, 1869, and were sold at from 2 to 3 florins per kilogram; 900 kilograms have since been exported, and more than 1000 are now ready. The total produce for 1870 will probably be 4000 kilograms of dry bark for exportation, besides some hundreds for use in the island. The stripping, cutting, drying, sorting, and packing are already becoming a considerable industry in the island.

Professor Miquel has given in the last published part of his "Annales Musei Botanici Lugduno-Batavi" (tom. iv., fasc. 9, 1869), descriptions of all the cinchona plants at present cultivated in Java.

The following are the names of the species, by the side of which in brackets we give those of Weddell's, where they are considered to be different by the latter. They are as follows;—*Cinchona Calisaya*, Wedd.; *C. amygdalifolia*, Wedd.; *C. scrobiculata*, H. et B.; *C. euneura*, nov. sp. Miq. (= *C. Calisaya* v. *fin.* Howard in Herb. Hasskarl); *C. Hasskarliana*, nov. sp. Miq. (this appears to be a hybrid between *C. Calisaya* and *C. Pahudiana*); *C. Carabayensis*, Wedd.; *C. officinalis*, L.; *C. lancifolia*, Mutis; *C. ovata*, R. et P.; *C. subsessilis*, Miq. *C. caloptera*; *C. micrantha*, R. et P.; *C. pubescens*, Vahl; *C. Moritziana*, Karst. (= *Buena Moritziana*, Wedd.); *C. magnifolia* R. et P. (= *Buena magnifolia*, Wedd.); and *C. carua* (= *Buena carua*, Wedd.).

CINCHONA CULTIVATION IN INDIA. With the exception of two half-yearly reports of C. B. Clarke, Esq., M.A., on the Bengal plantations, very little has been published on the Cinchonas in India, the subject having been fully treated in the Blue Book published last year, which was noticed at some length in the last Year-Book. In Mr. Clarke's report he says:—

"The three species of cinchona of which the cultivation has been extended during the year are *C. succirubra*, *C. officinalis*, and *C. Calisaya*.

The number of plants of these species in permanent plantations were as under :—

	<i>C. succirubra.</i>	<i>C. officinalis.</i>	<i>C. Calisaya.</i>
March 31, 1869	615,730	312,719	220
March 31, 1870	1,055,100	406,899	4,000
Increase	439,370	94,180	3,780

Of these three plants it is found that the following is the average annual growth of measured plants: *C. succirubra* was 51 inches, fairly representing the satisfactory general growth of plantations of this species. *C. officinalis* had only the very unsatisfactory growth of 12 inches, and *C. Calisaya* 52 inches. Under this latter name several important varieties are included. The *C. officinalis* does not thrive at all well, and shows no inclination to become a tree; it remains a shrub with very scanty foliage.

C. succirubra and *C. Calisaya* are planted about 1200 to the acre; *C. officinalis* about 4000 to the acre.

In the fifth year of growth in permanent plantations an acre of *C. officinalis* carries less than one-fourth the bark carried by an acre of *C. succirubra*, and costs more than four times as much annual expenditure. Moreover, the *C. officinalis* then appears disinclined to grow much larger, whereas *C. succirubra* will clearly grow into a considerable tree.

In the last report it is mentioned the season had been unusually wet, from which the *C. officinalis* has suffered more than during previous rainy seasons, and all hope must be abandoned that this species can be grown to an economic profit at Rungbee.

Of *C. officinalis*, it may be said generally of the older plants, that some 40 per cent. perished during the last six months, and that those which survived did not grow. The number of plants of *C. officinalis* has been by estimation reduced from 930,704 on 31st of March, 1870, to 440,000 on 30th Sept., 1870; but it would be best in any calculation regarding these plantations, to write off these 440,000 at once; for, though some of them may survive for years, there is no probability that any profitable result will ever be derived from them.

Throughout the *C. officinalis* plantation, below 4500 feet level, *C. succirubra* was planted in 1869 in order to utilize the area kept clean at considerable expense. These young *C. succirubra* promise exceedingly well. In fact the best practicable mode of cultivation of the *C. officinalis* remains yet to be ascertained. The *C. Calisaya*

progresses admirably, and as the feeling is gaining ground to restrict the cultivation to "paying species," this will certainly be one of those retained. Mr. Clarke mentions the fact that the barks of two new kinds of cinchona he obtained from the Neilgherries, one, named provisionally *C. mirabilis*, yielded $13\frac{1}{2}\%$ of quinine alkaloid and more than 9% of crystallisable quinine. The second, *C. pitayo* [recently obtained from Peru by Mr. Cross] is very rich in quinine and is a very high level species, said to be found growing through the snow.

During the year both *C. succirubra* and *C. officinalis* ripened seeds were distributed, one ounce of seed being sufficient to raise nearly 50,000 plants.

Number and Distribution of Cinchona Plants in the Government Plantations near Darjeeling on the 31st March, 1870.

Names of species of cinchona.	Number in permanent plantations.	Number of stock plants for propagation.	Number of seedlings or rooted cuttings in nursery beds for permanent plantations.	Number of rooted plants in cutting beds.	Number of cuttings made during the month.	Total number of plants, cuttings, and seedlings.
<i>C. succirubra</i> .	1,055,100	20,000	164,615	None	None	1,239,715
<i>C. Calisaya</i> .	4,000	10,000	8,758	32,274	2,000	57,032
<i>C. micrantha</i> .	29,667	None	None	None	None	29,667
<i>C. officinalis</i> , and varieties .	406,899	10,000	205,952	307,858	Ditto	930,704
<i>C. Pahudiana</i> .	5,092	None	None	None	Ditto	5,092
Total . .	1,500,758	40,000	379,325	340,127	2,000	2,262,210

What little bark has been sent to England has been chiefly the result of pruning and thinning out the plantations. These parcels however have given satisfaction in our markets. In the *Pharm. Journal*, Oct. 22, 1870, the following note of a parcel put up for auction occurs:—The parcel consisted of nineteen cases, each about eighty pounds in weight, and was described as red bark (*Cinchona succirubra*).

At a glance it was apparent that the greatest care had been bestowed upon its collection and preparation, and that it had been obtained from young trees whose ages did not vary considerably. It consisted entirely of quills, exceedingly uniform in their length (about fifteen inches), varying in thickness from the size of cinnamon bark to that of one's thumb; externally somewhat smooth, without lichens, of a greyish colour, with a pale reddish interior, resembling, to an unpractised eye, grey bark.

An average sample selected from five cases gave upon analysis in 100 parts—

Total alkaloids (hydrated)	3.36
Quina (by ether)	2.40
Cinchonidine and cinchonine	0.95
Crystallised sulphate of quinine	1.81

CINCHONA CULTIVATION IN CEYLON. The cultivation of the *Cinchona* in Ceylon is all that could be desired. The success is undoubted. During the past year, a large parcel of bark, consisting of *C. officinalis* and *C. succirubra* was offered for sale; and though it did not realize so high a price as it otherwise would have done owing to the Franco-German war keeping the continental buyers out of the market, yet it gave great satisfaction. The analysis of the bark by one of our first quinologists gave a very high percentage of quinine. It is to Ceylon we must look for our future supplies of this precious febrifuge, as India most probably will require all her home-grown bark for her own teeming millions.

Ipecacuanha Cultivation in India. (*Pharm. Journ.*, 3rd series, i., 5, 170, also *Trans. Edin. Bot. Soc.*, x., pt. ii., 1870.) The Indian Government, now that their labours have been so far successful with the cinchona cultivation, have turned their attention to the cultivation of the ipecacuanha. The following official documents have been published.

The supplement to the *Gazette of India* of 23rd January, 1869, contained a strong representation to Government from the Inspector-General of Hospitals, dated 5th October, on the advisability of introducing the cultivation of the ipecacuanha plant in an analogous manner to that of cinchona.

The suggestion was forwarded to Dr. Anderson (since deceased), the Superintendent of the Botanical Gardens, Calcutta, who stated that he had, for some years past, thought of the subject, but had been unable to procure any plants on trial until April, 1866, when one plant was sent out over land by the Director of the Royal Gardens at Kew. This original plant died soon after arrival, but, at the date of his writing, December, 1868, nine plants were in existence, artificially propagated from the original one, besides five growing at the cinchona plantations at Darjeeling, to which place a cutting had been sent in 1867.

The *Indian Medical Gazette*, on the authority of Mr. Clarke, now acting for Dr. Anderson, quotes the remarks of that gentleman:—
“When I took charge of the gardens, in 1869, there were seven

plants, all under glass, and in a very low state of vegetation. The plant had been found to grow very slowly, and, moreover, to be very shy of propagation by cuttings.

"It is very possible that when the plant once gets up, it may not prove slow-growing, and that when we once have plants that seed, it may not prove slow of propagation; but I fear many days will elapse before any produce is likely to be obtained."

The Duke of Argyll addressed the Governor-General on the 20th April, as follows:—"I have considered the dispatch from your excellency in Council, dated 25th January, urging upon me the importance of introducing the ipecacuanha plant into India, and suggesting that Dr. Anderson, Superintendent of the Botanical Gardens at Calcutta, now in this country, should be asked to submit proposals as to the best means for obtaining the object in view. On the application of the Government of Bombay last year, I had already recognised the importance of introducing this valuable medicine; and the two plants received at Bombay having died, I had already taken steps for procuring others for transmission in July next. I transmit to you the correspondence which has been held with Dr. Anderson on this subject; and I trust that, even should the other attempts fail, Dr. Anderson will still have a sufficient number of strong plants to take back with him to India to secure the introduction and establishment of the plant. It seemed to me that an application through the diplomatic agents of her majesty was not likely to be so successful as an application through commercial or scientific gentlemen. You will see from the accompanying memorandum by Mr. C. R. Markham, that he has written to Messrs. Miers & Co., of Rio, to Mr. Bramah, and to Dr. Otho Wucherer, to obtain roots of the plant. The accompanying correspondence with Dr. Cleghorn and Dr. Balfour will show you that I have also enlisted the kind assistance of the Royal Botanical Gardens at Edinburgh, besides the aid promised at Kew. I forward also copies of the memorandum on the propagation of the ipecacuanha plant prepared by Mr. M'Nab, of the Royal Botanical Gardens at Edinburgh. Dr. Christison and Dr. Balfour have likewise applied to Dr. Gunning, a medical practitioner at Rio, to assist them in obtaining plants and seeds. I add to these documents the letters which have passed between Dr. Hooker and this office on the supply of plants for Bombay. You will learn from my dispatch to that Government that the plants destined for them, will be retained at Kew, and two healthy plants will be sent to them from the Botanical Gardens at Calcutta."

The great difficulty, however, is the rarity of the plant, its remarkably slow growth, and delicate nature. Mr. McNab, of the Royal Botanic Gardens of Edinburgh, has written a very interesting article, in the Transactions of the Edinburgh Botanical Society, on the subject, in which he says, remarking on the slow growth of the plant, that one specimen now in the gardens, though they have had it more than thirty years, is at the present time scarcely 1 foot in height, having three leading shoots, each four inches long. He finds that when they are propagated in white sand, they send out roots in six weeks. Where a root shows more than one growing point, it may be divided, and thus each growing point becomes an independent plant.

He advises that when sent to this country from Brazil, the roots should be cut, sealing the ends, and packed horizontally between layers of sphagnum or any other clean moist moss. By others, sand is spoken of as the best packing medium. In sending whole plants, he recommends their being established in pots, and placed in boxes divided into compartments, like an ordinary bottle box, one pot in each compartment, the compartments not reaching to the bottom, the bottom having a layer of sphagnum over it, sphagnum being also placed on the top of the pot, and the plant and moss being secured, by being tied over with galvanized wire. The cases are, with the exception of these compartments, the same as the ordinary Wardian cases. Instead of the usual glazed top, he recommends thick cotton stretched across.

The plant is met with in Brazil from about latitude 8° to 22° S., in the forests of the Serra do Espinhaço, or mountain extending from the capital of Bahia, through the province of Minas Geraes, to the northern part of Sao Paulo, in moist shady situations.

Dr. Gunning, of Rio Janeiro, says that the plant is very scarce in the province of Rio Janeiro, from the plants having been pulled up and no effort to cultivate been taken. It is exported from Sao Paulo, the province south of Rio, but chiefly from Matto Grosso, a thousand miles up the River Plate.

Sumbulus Moschatatus. (*Hager's Centralhalle*, no. 39, p. 367, 1870.) Inspector Lungershausen of Moscow, reports in No. 27 of *Wochenschr. f. Gärtnerei und Pflanzenkunde*, that the hitherto unknown plant yielding musk, or sumbul root, is now in bloom in the botanical garden at Moscow. When the Russians occupied Bucharia the plant was discovered, and several roots were sent to Moscow, of which but one arrived in good condition. This new umbelliferous plant it was hoped would produce fruit, and

thus be propagated in Europe. The root has been used in Russia with considerable success in Asiatic cholera.

Professor C. Koch regards the plant as a very interesting one, on account of the strong musk odour of its root, and because the musk deer lives in the same regions. The root has been known for about thirty-five years, without, however, sustaining the high reputation it has gained in Russia, so that it belongs already to the obsolete remedies. It is now mainly employed in perfumery, in place of the high priced musk. There may, possibly, be two roots, both indigenous to Central Asia, one being exported through Russia, the other from the East Indies.

The musk root contains about nine per cent of a soft oleoresin, obtainable by ether, which in contact with water has the odour of musk. It contains a peculiar acid, *sumbulic acid*, which appears to differ from angelic acid and from umbelliferon. It has been long known that the root belongs to an umbelliferous plant; flowers and fruits have sometimes been found with it. The latter, differing from those of other umbelliferae, were made the type of a new genus, and the plant was named *Sumbulus moschatus*.

On the Blue Oil of Camomile. J. Kachler. (*Deutsch. Chem. Gesell. Ber.*, iv., 36.) Through repeated fractional distillations of the oil of camomile, the author obtained a series of oils, boiling between 220° and 300° C., and mostly isomeric or polymeric with camphor and terpen.

On Iva. (*Achillea moschata*.) Dr. A. v. Planta-Reichenau (*Annal. der Chim. u. Pharm.*, Aug., 1870.) The plant is known in Switzerland as "forest-lady's herb" (*Wildfraülein Kraut*), and has been used there for centuries as a stomachic tonic, etc.

The author collected the herb before flowering, without the root. It was, in the form of a coarse powder, distilled with steam, until volatile oil ceased to come over, and the aqueous decoction was evaporated to the consistency of an extract. The herb thus exhausted with water, was dried and extracted with alcohol until it ceased to impart to it a bitter taste; most of the alcohol was then distilled off.

Iva oil. The crude volatile oil is bluish green, of a peculiar, not disagreeable odour, and a taste reminding of peppermint. It commences to boil at 170° C.; the greatest portion distils between 180° and 210° C.; the distillate between 230° and 260° C. is brown, and has the odour of wormwood. A dark brown, soft resin is left behind, which is not bitter; insoluble in absolute alcohol, but readily soluble in ether and oil of turpentine. The rectified oil

was of a faint yellowish colour, an agreeable refreshing odour, and a warm bitter taste, reminding of peppermint. Its composition is $C_{48} H_{40} O_4$; the author names this *ivaol*.

Ivain. The dark green alcoholic liquid was precipitated by alcoholic solution of acetate of lead; the filtrate was treated with sulphuretted hydrogen, and the filtrate evaporated; the residue was washed with acetic acid until the washings were colourless, and afterwards with water, until it floated upon it. It was then repeatedly dissolved in alcohol and evaporated, to remove acetic acid, then treated with animal charcoal, and the alcohol evaporated. *Ivain* = $C_{48} H_{48} O_6$, has the consistency of Venice turpentine, is of a yellow colour, insoluble in water, and in alcoholic solution has a persistently bitter taste.

Achilleina. The aqueous extract was triturated with alcohol until it ceased to become coloured; the alcohol was distilled off, and the residue precipitated by water. The precipitate having been washed with water, the aqueous liquid was agitated with plumbic hydrate to remove acids. The filtrate was freed from lead, evaporated and alternately dissolved in absolute alcohol and in water, and evaporated until the achilleina yielded clear solutions with both liquids. Thus prepared, it has an alkaline reaction, is brownish, red, amorphous, friable, very hygroscopic, readily soluble in water, with more difficulty in absolute alcohol, insoluble in ether; its odour is peculiar, its taste very bitter, but not disagreeable. The author isolated also the bitter principle from *Achillea millefolium*, which had been obtained by Zanoa in a not entirely pure state, and found it to be identical with achilleina. Composition = $C_{40} H_{28} N, O_{20}$. The salts have not been investigated.

Moschatina. The precipitate obtained by water, in the concentrated alcoholic residue, was taken up by absolute alcohol, evaporated to dryness, and treated with water until the mass became pulverizable under water. It is of an aromatic bitter taste, little hygroscopic, barely soluble in water, fuses under water, upon the water-bath, and separates from its solution in hot water in a pulverulent condition. Composition = $C_{42} H_{27} N O_{14}$.

Achilletin. On boiling achilleina for several days with diluted acids sugar is formed, together with a volatile aromatic principle, and probably ammonia, and a dark-brown powder separates, which is not bitter; insoluble in water, sparingly in alcohol, and in this solution has an aromatic taste. Composition = $C_{22} H_{17} N O_8$.

The author also obtained stearic acid on cooling the tincture of *iva*, concentrated by distillation. The aqueous solution of the

ashes contained very little sulphate of lime and magnesia, but considerable quantities of alkali and chlorine. Nitric acid dissolves from the residue carbonates, much lime, also phosphoric acid and a little magnesia. The undissolved portion consisted of charcoal and much silica.

Ophelia Chirayta. Flückiger and Höhn. (*Pharm. Journ.*, 3rd series, i. 105.) This plant is an elegant annual *Gentiana* of the lower Himalaya, occurring from Simla, and through Kumasu, as far as Nepaul. In its outward appearance *Ophelia Chirayta* closely resembles our *Erythraea Centaurium*, though with several differences.

The chirayta commonly met with in English commerce is usually of very inferior character, and chiefly consists of stalks deprived of their leaves. The plant that has been examined by Höhn consisted, on the contrary, of well-preserved specimens retaining flowers, fruit, and roots, so that the essential characteristics of that nature could be well observed.

The woody stems were from 2 to 3 feet long, and $\frac{1}{4}$ inch thick at the lower ends, cylindrical, with knots at distances of $1\frac{1}{2}$ to 3 or 4 inches, at the upper ends obtusely quadrangular, with wings extending downwards. The colours varied from brownish-yellow to dark purple-red. The branches were more greenish or greyish-brown. The root is sometimes from 2 to 4 feet long, and twice as thick as the stem. It forms generally a simple tap-root, furnished with somewhat scanty fibres. Larger specimens present an angular bending of the root, probably indicating a growth of more than one year. Generally the stem rises isolated from the root, but in some instances plants were met with consisting of several stems. The numerous prolonged branches resemble in their arrangement those of *Erythraea Centaurium*, and towards the upper part they form a thick whorl. The insertion of the leaves and flowers may also be compared to that of the indigenous gentian referred to above. The lower leaves of *Ophelia* are often 3 cm. in length and 7 mm. broad; the upper ones are very much smaller. All of them are acutely lancet-shaped, smooth-edged, cordate at the base, and, like the entire plant, perfectly glabrous. According to the size of the leaves, they present 3, 5, or 7 ribs, of which the central one is the thickest.

The yellow, four-parted corolla is about 12 mm. long, and rather glandular at the base. The calyx is much shorter than the corona. The fruit is a one-celled capsule, with two valves at the apex.

The flower possesses the same intense bitter taste that is characteristic of chirayta. It is only the woody substance of the thickest

stems that is not bitter; this contains a considerable pith. Even the branches present in sections a broad ring.

The popular name of this drug in India is *Oreyat*, and it has been applied to several varieties of *Ophelia*, more especially *O. angustifolia*, *O. elegans*, and *O. densifolia*, to which the authors particularly refer.

All these varieties are described as quite as bitter as the true chirayta, and as being, in fact, used in the place of it throughout the north-western, central, and southern provinces of India.

In the Indian Pharmacopœia there is an infusion of chirayta, and an aromatic tincture with cardamoms and orange-peel.

By extracting the stalks and roots with alcohol of 60 per cent. sugar, wax, chlorophyll, soft resin, tannin, an acid (ophelic), and a peculiar bitter substance (chiratin), were dissolved.

The acid was syrupy, and very deliquescent, yellowish-brown, tasting at first slightly sour, afterwards intensely bitter. When warmed it smells like lugian; it dissolves in water with some turbidity (due, perhaps, to resin), completely in alcohol, or a mixture of spirit with ether. It decomposes alkaline solution of copper when warmed with it; also ammoniacal solution of silver; with alkalies it darkens; with perchloride of iron it becomes reddish-yellow; with sulphate of copper dirty green; with lead salts yellow, and forms amorphous compounds with acids. Analysis of the lead compounds gave $C_{28} H_{30} O_{30}$ as the formula.

Chiratin is a pale yellow, very hygroscopic powder, at the utmost capable only of a granular crystallisation; it is very bitter, sparingly soluble in cold water, rather more in hot water, readily soluble in alcohol or ether. It is neutral to test-paper, does not reduce alkaline solution of copper, and gives with tannic acid a copious white flocculent precipitate; formula $C_{20} H_{38} O_{30}$. By the action of acids chiratin is separated into ophelic acid and a yellowish-brown amorphous substance that is not sugar, but tastes bitter, is scarcely soluble in water, readily soluble in spirit, does not reduce copper solution. Höhn assigns to it the formula $C_{28} H_{34} O_6$, and the name chiratogenin.

The herb itself gave the same results as the stem and roots.

Adulteration of Chiretta. E. A. Webb. (*Pharm. Journ.*, 3rd series, i., 367.) At the Pharmaceutical meeting for November, the author referred to a specimen of an original packet of chiretta, one of a number imported into England about a year ago. It was curious from having in the centre a package of a distinct plant, which had been first carefully tied up by itself, and then surrounded by the

chiretta. The adulterant consisted of munjeet (*Rubia cordifolia*), which at that time was worth only a fourth or a fifth of the value of chiretta.

The following are the chief characters by which it may be distinguished:—

It is a trailing plant, with an underground stem about the thickness of a quill, giving off rootlets at intervals; of a dull reddish colour externally, but brighter internally. The stems are long and trailing, quadrangular, the angles being covered with small recurved prickles. The cortical portion, when old, soon breaks off from the internal woody portion, which is round, and of a red colour like the root.

The leaves are about an inch and a half long, supported upon peduncles about half that length, arranged in whorls of four at the nodes, which are very conspicuous. They are five-ribbed, with an entire or dentate margin, and generally more or less cordate.

The specimen examined had no signs of flower or fruit upon it.

The true *Ophelia chiretta*, on the other hand, has a thick branching root, a round, smooth brown stem, sessile amplexicaul opposite leaves, and purely bitter taste.

Tylophora Asthmatica: a new emetic. M. C. Cooke. (*Pharm. Journ.*, 3rd series, i., 104.) It having been recently proposed to introduce and cultivate ipecacuanha in India, the author suggests the advisability of inquiring whether any native drugs exist already in that country, which might be employed as a substitute for ipecacuanha. He mentions several plants which have a local reputation as emetics, and selects the *Tylophora asthmatica* (W. and A.) as being probably the best recommended of them all. The leaves are included in the new Pharmacopœia of India as a primary article, and the evidence goes to show that they are an excellent substitute for ipecacuanha.

This plant is the *Asclepias asthmatica* of Roxburgh, and the *Cynanchum* of some other authors. It is a very abundant and widely diffused plant in India, being to be met with in nearly all situations, and in flower at all seasons. Dr. Kirkpatrick states, "I have administered this medicine in at least a thousand cases, and found it most valuable. In dysentery, and as a simple emetic it is in every way comparable with ipecacuanha." In catarrhal and chronic coughs, it seems to act well. Its efficiency as a substitute for ipecacuanha, not only as a simple emetic, but as a remedy in dysentery, asthma, and catarrhal affections is confirmed by the report of Dr. Oswald, Mr. Moodeen Sheriff, and others. Roxburgh

says that "on the coast of Coromandel, the roots have often been used as a substitute for ipecacuanha. I have often prescribed it myself, and always found it answer as well as I could expect ipecacuanha to do."

The leaves are considered preferable to the root; in fact the leaves only are recommended in the Pharmacopœia of India. The dose there stated is—as an emetic, from five-and-twenty to thirty grains of the powder of the dried leaves, conjoined with half a grain or a grain of tartar emetic; as a diaphoretic and expectorant, from three to five grains, thrice daily or oftener, combined with opium, and other remedies of the same class. It is also stated on the authority of the same work, that this is one of the best indigenous (Indian) substitutes for ipecacuanha. It is easy enough to obtain this drug from India, and it certainly seems worthy of a trial here.

The Seeds of two Species of Strychnos. J. M. Maisch.* (*Amer. Journ. Pharm.*, xliii., 241.) The author writes:—Last fall I was informed that a vessel, which had arrived at the port of New York from the East Indies, had brought, as ballast, a quantity of seeds of a species of strychnos. To the kindness of Dr. Fr. Hoffmann I owe some small sample of the same, and subsequently Messrs. M'Kesson and Robbins very kindly went to the trouble of hunting up for me a few pounds of the same seeds, which, under the name of Indian gum-nuts, were offered for sale in New York, without finding a purchaser. I felt interested to ascertain whether, like the seeds of some other *Strychnæ*, they contain strychnia. I exhibited the seeds at the Pharmaceutical Meeting in February, and showed, at the same time, from my cabinet, some seeds of *Strychnos Tienté*, Leschenault. This plant grows in the mountainous districts of Java, and its juice is used by the Malays to prepare the poison called upas radja, or upas tienté tjettek. The tienté seeds are orbicular or somewhat oblong, disk-like, resembling in shape nux vomica, five-eighths to three-quarters of an inch in diameter, yellowish-grey in colour, and covered with soft, appressed hairs, having a silky lustre; the disk is rather sharp-edged, with a slightly-projecting point, indicating the hilum, and covering the somewhat club-shaped radicle of the embryo. As in nux vomica, the white horny albumen has the shape of the seed, and is composed of two disks united near the circumference, thus enclosing a hollow space, into which the cotyledons project, occupying one-quarter to one-third the diameter

* Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, May 16.

of the cavity. The cotyledons are broadly oval, scarcely cordate, rather acute, three to five-nerved.

Spach* describes the tienté seeds as follows:—Elliptic, oval or sub-orbicular, velvety, brownish (*brunâtre*), lenticular, or plano-convex; embryo projecting from the hilum, marginal, about one-third shorter than the perisperm; cotyledons heart-shaped, acuminate, nerved, foliaceous; radicle club-shaped, as long as the cotyledons. The description corresponds closely with the tienté seeds in my possession, the colour excepted.

The so-called Indian gum-nuts are subglobose, of an appearance as if composed of two unequally-convex halves, with an elevated line surrounding the largest circumference; they are of a dirty, somewhat brownish-grey colour, with very short, closely appressed hairs; the largest diameter is three-eighths to one-half inch. A rather thin, but hard integument covers a horny albumen, which encloses, as in *nux vomica*, an orbicular cavity, into which the embryo reaches to about one-third the diameter. The radicle is marginal, short, cylindrical; the cotyledons are broadly oval, somewhat acuminate, and about three-nerved. Notwithstanding the horny texture of the albumen, the seeds are readily broken in an iron mortar, but are difficult to powder; their taste is insipid, not bitter.

When the seeds are boiled with dilute muriatic acid, they become very soft, so that they are readily mashed between the fingers; the acid decoction, which is not precipitated by iodohydrargyrate of potassium, was treated with an excess of lime, the precipitate washed with cold water, dried, exhausted with boiling alcohol, and the clear filtrate evaporated; a yellowish mass was left without the slightest tendency to crystallise. It had an insipid taste, and did not show the colour reactions of either brucia or strychnia; concentrated sulphuric acid decomposed it rapidly. The seeds, therefore, contain no alkaloid.

In the East Indies, the seeds of *Strychnos potatorum*, Linn. fil., are used for clearing muddy water, under the name of tettan-kotta, or clearing-nut. Spach† describes them as greyish, suborbicular, about five lines in size. Dr. Waring‡ says that they are of a flattened, spherical form and yellowish-grey colour, having the testa covered with short, close hairs; albumen horny and tasteless. As far as they go, these descriptions agree with the Indian gum-nuts, which I believe to be derived from *Strychnos potatorum*, Linn. fil.

* "Histoire Naturelle des Végétaux." Phanérogames, viii., 485. Paris, 1839.

† Loc. cit.

‡ "Pharmacopœia of India," p. 146. London, 1868.

According to the Pharmacopœia of India, these seeds are also used in native practice as an emetic (Ainslie), as a remedy in diabetes (Kirkpatrick), gonorrhœa (Taleef Shereef), etc. On what principle the clearing action depends is a matter of speculation. Dr. O'Shaughnessy, at one time, thought it was due to an astringent principle, while Pereira* supposed it to depend on the presence of albumen and casein, and Guibourt attributes it to mucilage or pectin. The seeds are free from tannin, contain but little albumen, while, in the few experiments instituted by me, I could not ascertain the presence of casein or pectin. A considerable proportion of a peculiar mucilage is present, which does not yield a very ropy solution, and is not precipitated by alcohol, acetate of lead or sesquichloride of iron. If vegetable matter is suspended in water, the turbid liquid put into two glass vessels, and solution of this mucilage added to one, the latter liquid will settle the suspended matter in a short time, while the other remains turbid much longer.

The testa appears to offer obstructions to the absorption of water by the albumen; for, if the testa be unbroken, the seeds may be immersed in cold water for twenty-four hours, and still retain their hardness; but, if the testa is partly removed, or the seeds are broken, the albumen, after twelve hours' immersion in cold water, becomes soft enough to be readily split by the finger-nail.

Gelsemium Sempervirens. R. Bartholow. (*Practitioner*, Oct., 1870, p. 200.) The author has published some experiments instituted to determine the physiological action of gelsemium on the nervous system. He finds that the active principle of the plant, gelseminate of gelsemia, being a crystalloidal substance, is rapidly absorbed into the blood, and exercises a sedative action on the nervous system. In its physiological action gelsemium corresponds more nearly to conium than to any other agent.

Conium is a paralyzer, but, unlike gelsemium, the paralysis commences at the periphery, and rapidly extends to the motor centre. Conium, like gelsemium, does not destroy the muscular irritability. Gelsemium impairs the sensibility of the sensory nerves, which conium does not. Both cause death by asphyxia—paralysis of the muscles of respiration. In their effects on the brain these agents act similarly. Neither destroys, *per se*, the functions of the brain consciousness being preserved until carbonic acid narcosis supervenes. Both produce dilatation of the pupil and blindness; but gelsemium more distinctly paralyzes the third pair than conium.

The Mullein Plant. (*Pharm. Journ.*, 3rd. ser., i., 365, from *New York*

* *Pharm. Journ. and Trans.*, ix., 478. 1850.

Drug. Circ.) The mullein (*Verbascum thapsus*) is a biennial plant, with a straight, tall, stout, woolly, generally simple stem, occasionally with one or two branches above, winged by the decurrent bases of the leaves, and from three to five feet high. The leaves are alternate, oblong, acute, rough and densely tomentose on both sides. The flowers are a golden yellow colour, rotate, nearly sessile, and are arranged in a dense, spiked, club-shaped raceme; calyx five-parted and downy; corolla five-lobed, rotate.

Mullein is common in the United States, growing in recent clearings, along the sides of roads, in slovenly fields, etc., flowering from June to August. Some botanists consider it to have been introduced from Europe. The leaves and flowers are the parts used. They have a faint, rather pleasant odour, resembling that of a mild narcotic, and a somewhat bitterish, albuminous taste, and yield their virtues to boiling water. Mullein is demulcent, diuretic, anodyne, and anti-spasmodic. The infusion is useful in coughs, catarrh, hæmoptysis, diarrhoea, dysentery, and piles. Its diuretic properties are rather weak, yet it is very useful in allaying the acridity of urine which is present in many diseases. It may be boiled in milk, sweetened and rendered more palatable by the addition of aromatics, for internal use, especially bowel complaints. A fomentation of the leaves also forms an excellent local application for inflamed piles, ulcers, and tumours. The leaves and pith of the stalk form a valuable cataplasm in white swellings; and infused in hot vinegar or water, it makes an excellent poultice to be applied to the throat in cynache tonsillaris, cynache maligna, and mumps. The seeds are said to pass rapidly through the intestines, and have been successfully used in intestinal obstructions. They are narcotic, and have been used in asthma, infantile convulsions, and to poison fish. The infusion may be drunk freely. The flowers, placed in a well-corked bottle and exposed to the sun, are said to yield an excellent relaxing oil.

On the Time for Collecting the Leaves of Digitalis. By F. Schneider. (*Schweiz. Wochenschr. f. Ph.*, and *Amer. Journ. Pharm.*, xlii., 221.) The pharmacopœias and text-books state that these leaves should be collected from the flowering plant. The author had the leaves annually collected in the Black Forest during the latter part of May or beginning of June, requiring always some flowering stems. In appearance he had a beautiful drug, but rarely could he get a satisfactory reaction by tannin and ferrocyanide of potassium in the infusion. In 1869, a botanical friend, formerly apothecary, offered to supply digitalis, which he collected near the

end of August and beginning of September, as he had done during his long pharmaceutical practice, from the rosulate leaves of plants, flowering the following year. The digitalis yielded a deeply-coloured infusion, of strong odour and taste, and gave with tannin at once a dense precipitate; with ferrocyanide of potassium, after twelve to fifteen minutes, a strong turbidity. The leaves should, therefore, be collected not in the flowering season, but late in summer.

Amount of Active Substance in Conium Maculatum. (*Dochenblattes der K. K. Gesellschaft der Aertze in Wien*, 1870, No. 1.) In an address recently delivered by Professor von Schroff to the Society of Physicians in Vienna, he stated that his experiments have led him to the following conclusions:—

I. The unripe fruit of one-year conium plants contains the smallest amount of conia.

II. The unripe fruit of the two-year plants contains most conia, especially when the development of the fruit is advanced, and it is near ripening.

III. The perfectly ripe fruit, which is produced only by the two years' plant, stands in regard to its efficacy between those mentioned above.

Gingilie Oil. (*Pharm. Journ.*, 3rd series, i., 226, from *Jaffna News*.) The gingilie (*Sesamum Indicum*) is said to be an African plant, and is supposed to have been introduced to the West Indies by the negroes. It is now pretty generally distributed, and in this country it thrives admirably in the Newera Kalawya district. The plant is cultivated for the seed, which yields a fixed oil. The method adopted in Ceylon of expressing the oil is rather primitive, and consequently it possesses an unpleasant flavour and a brown muddy colour. If properly prepared, the oil would form a very good substitute for sweet oil. The best method of preparing the oil is as follows:—First steep the seeds repeatedly in cold water, or boil them for a short time, till they are divested of the reddish-brown colouring matter contained in the epidermis of the seeds, then, when the seeds have become perfectly white, dry them in the sun, and express the oil in the ordinary way. The seed yields from 40 to 44 per cent. of a pale straw-coloured oil. When thus prepared, the oil is perfectly devoid of smell, and may be used for extracting the perfume of the jasmine, tuberose, camomile, and yellow rose. To effect this, one weight of the flowers should be added to three weights of the oil in a bottle, which should be corked and left in the sun for forty days, when the oil will be impregnated with the

perfume of the flowers. The gingilie oil is soluble in alcohol, saponifies with alkalis, solidifies by nitric acid, and combines with the oxide of lead. The gingilie oil is highly esteemed by Egyptian belles for its properties of cleansing the skin and of imparting to it a bloom and lustre, and also of preserving the beauty and gloss of the hair. In Ceylon it is used for similar purposes. The negroes also use the seeds for making a sort of beverage something like coffee, by roasting the seeds and infusing them in water. The commercial value of the oil in England is £40 per ton.

Magnificent Fluorescence of Peppermint Oil. Professor Flückiger. (*Pharm. Journ.*, 3rd series, i., 682.) 50 to 70 drops of peppermint oil shaken with one drop of nitric acid, about 1·2 sp. gr., turn faintly yellowish, brownish, and after an hour or two, exhibit a most beautiful blue-violet, or greenish-blue colour, when examined in transmitted light. When observed in reflected light, the liquid is of a copper colour, and not transparent. If the mixture is warmed, the green or blue colouration takes place speedily; it may also be immediately provoked by adding a greater amount of nitric acid, say 1 drop to 19 or 20 drops of the essential oil.

Bisulphide of carbon contributes in no way to improve the test. All the various specimens of peppermint oil at the author's command show the same behaviour, but the blue or greenish-blue hue exhibits very appreciable differences, which ought to be further examined by chemists possessing authentic specimens of the oil under notice. A very old specimen of an originally excellent English oil, however, was no longer coloured.

The colour which peppermint oil thus acquires is remarkable on account of its persistency, for it lasts a week or two, at least in cold. Yet, unfortunately, it appears not capable of being applied as a true test; an admixture of 5 per cent. of oil of turpentine, for instance, does not at all prevent peppermint oil from assuming the blue or green colour; on the other hand, the author has not as yet met with any other oil partaking of the same behaviour; carven, the more volatile portion of caraway-oil, also acquires a slight similar fluorescence, but by no means comparable to the above-described as regards purity and intensity of colour.

Peppermint oil, which has become coloured in this way, is quickly decolourized if shaken with carbonate of calcium; granulated zinc likewise causes it slowly to turn brownish. Spectroscopic examination of the coloured oil furnishes no phenomena of particular interest. Chromic acid, dissolved in chloroform, does not perform the same reaction as nitric acid.

Detection of Turmeric in Powdered Rhubarb and Yellow Mustard. Dr. J. M. Maisch. (*Amer. Journ. of Pharm.*, xliii., 259.) A small quantity of the suspected rhubarb is agitated for a minute or two with strong alcohol, and then filtered, chrysophanic acid being sparingly soluble in this menstrum. The brown yellow colour of the filtrate is due to the resinous principles of rhubarb mainly; if adulterated with turmeric, the tincture will be of a brighter yellow shade; a strong solution of borax produces, in both tinctures, a deep red-brown colour. If now pure hydrochloric acid be added in large excess, the tincture of pure rhubarb will instantly assume a light yellow colour, while the tincture of the adulterated powder will change merely to a lighter shade of brown red. The test is a very delicate one, and is based on the liberation of boracic acid, which imparts to curcumine a colour similar to that produced by alkalies, while all the principles of rhubarb soluble in strong alcohol yield pale yellow solutions in acid liquids. The same test, applied in the same manner, is also applicable to ground mustard seed. The seeds of *Sinapis alba* yield a powder of a yellow-grey colour, entirely distinct from the colour of yellow mustard met with in the trade. Agitated with alcohol, and filtered, a turbid solution is obtained, which assumes a bright-yellow colour on the addition of the borax solution, and becomes colourless or whitish again on being supersaturated with hydrochloric acid. If the mustard be coloured with turmeric, the filtrate has a yellow tint, becomes brown-red by borax, and retains the colour on addition of hydrochloric acid. All the so-called yellow mustard of commerce which the author has had occasion to examine, whether ground in England or in the United States, contains turmeric, a practice which ought to be discountenanced; for under the yellow colour imparted by turmeric, adulteration of mustard may be carried on to an almost indefinite extent, if strength be supplied by the addition of a little capsicum.

California Castor Oil. The *Marysville Appeal* has the following account of a recent visit to the castor-oil manufactory of Dr. M'Daniel, situate at Marysville:—"Being a novice in the preparation and pressing of the castor-bean, and the process employed to produce the pure oil, we were surprised at the simplicity of the machinery and everything connected with the *modus operandi*. The beans are first subjected to a dry heat of an hour or so in a furnace. This softens them and brings them to that peculiar state required in expeditious pressing. They are then taken out and placed in a screw-press, run by horse-power, and capable of pressing between 80 and 100 gallons of oil per day. From the press the oil is con-

veyed into a vessel, and from thence into a large iron tank or boiler. In this is placed 60 gallons of oil, and the same amount of water, the latter serving to cleanse the oil of all impurities. The oil is then boiled about an hour, and kept standing until the next morning, when the water is drawn off and the oil transferred to the clarifiers, which are composed of zinc, and capable of holding from 60 to 100 gallons each. After standing about eight hours in the sun, it is taken out and put into cans, and is ready for the market. Beans of a superior quality are worth about \$90 per ton, and 100 pounds are supposed to produce 5 gallons of oil.

On the Circular Polarization of Castor Oil. By O. Popp. (*Arch. Pharm.*, 2, cxlv., p. 233). Castor oil possesses the property of rotating a ray of polarized light. The amount of rotation was observed of solutions of castor oil in absolute alcohol. Ten per cent. solutions of pure Italian and Ostend castor oils gave as a mean result, a direct deviation of 10° to the right, which gives as the specific rotating power of castor oil (α) = $+12.15^\circ$. This behaviour of castor oil may be used as a test of its purity, although the specific rotating power is too small to allow small quantities of adulteration to be detected. Castor oil also contains a constant quantity of nitrogen, which is possibly due to the presence of an alkaloid. Popp is inclined to believe, that not only the purging properties, but also its circular polarization, are due not to the oil itself, but to the presence of this alkaloid.

On the Behaviour of Castor Oil with Petroleum and Paraffin Oils. Harry Napier Draper. (*Chem. News*, vol. xxii., p. 162.) The liquids used in these experiments were:—

Petroleum oil	0.810 sp. gr.
Paraffin oil	0.817 " "
Petroleum spirit	0.710 " "

Each of these dissolves, at 16° C. in all proportions, the following fatty bodies:—

Almond oil.	Theobroma oil.
Olive oil.	Palm oil.
Rape oil.	Cod-liver oil.
Linseed oil.	Lard oil.
Sesame oil.	Cocoa-nut oil.
Croton oil.	Ergot oil.

And as these taken collectively typify a very large series of fatty oils, it may reasonably be supposed that there are but few exceptions to the rule of solubility. Castor oil, however, forms a very remarkable one. This oil which is, on the one hand, separated from all

others by its complete solubility in alcohol of sp. gr. 0.829, is, on the other, so insoluble in the petroleum hydrocarbons, that the addition of even one-half per cent. to either paraffin oil or refined petroleum at 16° C. causes turbidity. At 50° C. a large quantity is taken up, but separates immediately as the liquid cools.

But though castor oil is itself insoluble in the petroleum oils, it exercises itself a solvent action upon them, which is remarkable for being limited in a very unusual manner.

If castor oil be shaken with excess of petroleum spirit at 16° C., and allowed to rest, it will be found to form two layers, the upper of which consists of petroleum spirit alone, and the lower of a mixture of petroleum spirit and castor oil in equal volumes.

The results of several experiments have shown that—

100 vols. of petroleum spirit dissolve 100 vols. of castor oil.

100 " " oil " 67 " "

100 " paraffin oil " 67 " "

If the hydrocarbons be agitated with castor oil in any larger proportions than these, the excess separates, but the increase in volume of the castor oil is always the same, so that castor oil does not affect the separation of any particular hydrocarbon.

There is no difference in the behaviour of East-India and Italian castor oils.

This reaction cannot, unfortunately, be used as a test for the presence of castor oil in other oils, because the presence of other fatty bodies in any quantity renders castor oil soluble in the petroleum oils. It will, however, distinguish this series of hydrocarbons from benzol, in which castor oil is soluble in all proportions.

Fontainea Pancheri. Dr. Heckel. (*L'Union Pharm.*, 1870, xi., 359.) The author published a detailed account of this plant, which belongs to the *Euphorbiaceæ*, and is a native of New Caledonia. All parts of the tree contain a bitter and caustic juice, but the plant is chiefly remarkable for a drastic oil, which may be extracted from its seeds, and which closely resembles croton oil in its physiological properties.

The Riga Pine. M. Keller, of Darmstadt, writing in "*Cosmos*," says that what is known outside Russia as the Riga pine, which has been praised for its specially good qualities, is unknown by any distinctive appellation at Riga, and is, in fact, nothing more than the ordinary *Pinus sylvestris*.

The Adulteration of Saffron. D. Hanbury. (*Pharm. Journ.*, 3rd series, i., 241.) The author directs attention to the serious amount of adulteration to which saffron is now subject. The sophisticated

article, known in commerce as Alicante saffron, contains a quantity of carbonate of lime, which has been made to adhere to the thread-like saffron, without in the least altering its general appearance. To ascertain the amount of earthy matter thus fraudulently added, he subjected several specimens of saffron to incineration, each having in the first instance been dried in warm air until it ceased to lose weight. The results indicated that while good Valencia saffron yields from 4 to 6 per cent. of ash, the Alicante furnishes from 12 to 28 per cent.

The method of testing a sample of saffron for earthy adulteration which he recommends is this:—Place in a watchglass a very small quantity (say 1 grain) of the saffron, and drop upon it 8 or 10 drops of water; lightly touch the saffron with the tip of the finger, so as to cause the water to wet it. If the drug is free from earthy matter, a *clear*, bright-yellow solution will be immediately obtained; if adulterated, a white powder will *instantly separate*, causing the water to appear *turbid*; and if a drop of hydrochloric acid be now added, a *brisk effervescence* will take place.

Saffron almost always contains a few of the pale yellow stamens, accidentally gathered; but the pollen from them, which is detached when the drug is wetted, but which is minute in quantity, is easily distinguished from carbonate of lime by not dissolving when hydrochloric acid is added. Moreover, the form of pollen grains may be easily recognised under the microscope.

The author adds that an effectual method of examination is to scatter a very small pinch of saffron on the surface of a glass of warm water. The stigma of the saffron-crocus immediately expands, and exhibits a form so characteristic that it cannot be confounded with the florets of safflower, marigold, or arnica, or with the stamens of crocus itself.

Mr. John Ingham also describes (*Pharm. Journ.*, 3rd series, i., 624), a very impure sample of saffron, supplied to him by a well-known drug firm. It yielded 45 per cent. of mineral impurity, and also contained a quantity of the crocus stamens.

Historical Notes on Radix Galangæ. D. Hanbury. (*Journ. Linnean Soc., Bot.*, xiii., 20.) The drug known as galangal has been an object of trade for many centuries between Europe and the East. It is a stimulant and pungent aromatic of the nature of ginger, which it might be used to replace; but the many virtues ascribed to it by the ancients must be ignored. It was apparently unknown to the Greeks and Romans; its introduction into Europe was due to the Arabians, in whose writings it is

requently mentioned, being an ingredient of the compound medicines then in use. This is as early as the tenth and eleventh centuries; in the fifteenth century it was already in common use in Europe. In 1563 it was first pointed out that there are two kinds of galangal, the smaller kind or *radix galangæ minoris*, obtained from China, and the larger kind from Java. The latter, the *Alpinia galanga*, Willd., is not known in Europe; the former, named by Dr. Hance *Alpinia officinarum*, is alone seen in European commerce. It is used to a considerable extent in the East as a substitute for ginger. Considerable quantities are annually sold in London, but entirely for shipment to the Continent, a large quantity being consumed in Russia. It is used by brewers, and also for the purpose of giving an aromatic flavour to vinegar. By the Tartars it is used as a tea, and in some places as a cattle medicine. During last year 2300 cwt. were exported from China.

The Medicinal Properties of the Cocoa-Nut. (By John R. Jackson, A.L.S. (*Pharm. Journ.*, 3rd series, ii., 24.) The cocoa-nut (*Cocos nucifera*, L.) is a well-known economic plant, and is extensively cultivated in tropical countries. It is estimated that in Travancore alone there are ten million of these trees growing. The fruits are a most important article of food in the countries where they grow, while the oil and the fibre of the husk—known as coir—are valuable articles in British commerce.

The cocoa-nut is not a recognised medicinal plant in European practice, though the oleine obtained by pressure from the crude oil and refined, has been used as a substitute for cod-liver oil, experiments having shown that its effect in increasing the weight of the body is almost equal to that of the latter, but that its continued use is apt to disturb the digestive organs and produce diarrhoea. The crude oil, as brought into England, is obtained by boiling and pressing the white kernel or albumen. While in a fresh state, and in a liquid form, this oil is of a pale yellow colour, and almost without smell; it is much used in cookery by the natives, but becomes partially solid and turns rancid before it arrives in this country, where, for the purposes of the candle-maker, the stearine or solid fat is separated from the fluid. Cocoa-nut oil is said to be useful in strengthening the growth of the hair.

The milk of the cocoa-nut is more important to the natives in a medicinal point of view than the oil; in India they use it as a purifier of the blood, and we have heard from many an English resident in our eastern possessions, that it is not only an excellent medicine for the purpose, but that nothing can possibly be more refreshing to

a thirsty traveller under a tropical sun than a good draught of fresh cocoa-nut milk. As we obtain it in this country, it has not only lost its freshness and fine flavour, but has also lost its medicinal properties. When quite fresh it has been employed successfully by English doctors in India in cases of debility and incipient phthisis, and it also forms an excellent substitute for, if indeed it is not preferable to, cows' milk for tea and coffee. In large doses, however, it is said to act as a purgative, and on this account has been recommended in lieu of castor oil for those who cannot overcome the nausea arising from the latter. In the Fiji Islands the milk is very extensively used, but it has been supposed, with how much truth we are not able to say, that the continued use of it predisposes to the dropsical complaints which are said to prevail in those islands.

The toddy or wine which is obtained from the flower-spikes is described as being very refreshing and delicious, taken before sunrise; it is given by the native doctors in cases of consumption, and if taken regularly it is said to be an excellent medicine for delicate persons suffering from habitual constipation.

Palm Oils of Commerce. P. Guyot. (*Chem. News*, xxi., 300.) Palm oil is obtained from the fruit of the *Avoira* or *Orocro* palm-tree (*Elaeis guineensis*), growing on the coast and also in the interior of Guinea. It yields two kinds of oil, viz., a white-coloured, butter-like substance, extracted from the kernel of the fruit, and chiefly used by the natives as food; the point of fusion of this oil is stated to be rather high. The other kind is extracted from the fibrous sarcocarpon surrounding the fruit; at the prevailing temperature of its native country, this oil is fluid, but in Europe it has the consistency of butter; its colour is yellowish orange, and its smell is very much like that of violet flowers; it is insoluble in cold as well as boiling water, slightly soluble in alcohol, and very soluble in ether. The author gives in a tabulated form the results of the action of different reagents upon the oil alluded to, and some of the commercial varieties thereof, as imported from other countries, where the oil is obtained either from the same or some other kind of palm-tree. The action of the reagents alluded to (sulphuric and nitric acids, ammonia, chloride of zinc, protochloride of tin, pernitrate of mercury, and liver of sulphur) is not sufficiently characteristic to be specifically quoted here; and this is the less necessary because, as the author also states, adulteration of these oils would not be practised in the country whence they are exported, and certainly not in Europe; unless it were done in a very wholesale manner, and with the application of very inferior fats. The complete solubility

in ether is a sufficient test of purity; the colouring matter is readily destroyed when desired.

Sabadilla. A. Ernst. (*Pharm. Journ.*, 3rd. series, i., 513). At the meeting of the Linnean Society, held Dec. 15th, a paper was read on sabadilla (*Asagraea officinalis*, Lindl., *Sabadilla officinarum*, Mandt.) from Caracas, by A. Ernst. The writer remarked that it does not appear to be generally known that a considerable quantity of sabadilla is exported from Caracas and Venezuela, amounting to from 3000 to 3500 quintals annually; almost the whole being sent to Hamburg. The plant is a very common one by the roadsides in Caracas, but the greatest part of the drug comes from the hilly regions in the south, where it grows at an elevation of from 3500 to 4000 ft. It was originally discovered in the Mexican Andes, and is not known elsewhere. Although not mentioned by Humboldt, it is, however, apparently indigenous in Venezuela. It flowers in August and September, while Humboldt was there in the dry season; and it is besides very local in its distribution. The writer bases his belief in its being indigenous on several circumstances. In the first place the spots where it grows are the most unlikely for it to have been planted; and it has no special means of easily spreading its seeds. There is no record of its introduction; yet it was known long before the seeds were first exported by German druggists. The Caracasian form differs slightly in the width of the leaves and a few other characters from the typical *A. officinalis*, of Mexico, and might be called *A. Caracasana*, but the writers did not consider it specifically distinct. The bulbs contain numerous raphides of oxalate of lime.

In the discussion which followed, the President (Mr. Bentham) agreed with the writer, that there was not sufficient ground for forming the Caracasian sabadilla into a distinct species, especially as Lindley's description was drawn from dried specimens. Mr. Hanbury regretted that the writer had not accompanied his paper with specimens of the plant. He said it was a mistake to suppose that pharmacologists are not aware that the drug is exported from Venezuela. The fact is mentioned by Flückiger, of Berne; while Berg and Schmidt even mention the difference between the two varieties.

Medicinal Ferns. (*Pharm. Journ.*, 3rd series, i., 181.) M. C. Cooke.

Ferns have been rather extensively employed in medicine, and some of them have acquired considerable reputation; but it is doubtful whether, with two or three exceptions, they are of any

real value. Some are probably inert, others only possess properties which are more highly developed in other substances. On the whole, ferns are by no means important remedial agents, and their enumeration is more matter of curiosity than suggestive of value. The present list, though long, is probably imperfect, at least it contains the most important and popular species.

Acrostichum Huacsaro, Ruiz. The rhizome of this species is employed in Peru as "middling calaguala," "cordoncillo" or "huacsaro." It is substituted for the genuine "calaguala."

Adiantum Æthiopicum, Linn. This is a Cape species. An infusion is sometimes used as an emollient in coughs and diseases of the chest. A syrup is also prepared from it. The Basuto Kafirs, who call it "ma-o-ru-metsoo," employ its caudex in the shape of decoction for promoting parturition.

Adiantum caudatum, Linn. An infusion is employed in the Mauritius as a diaphoretic and instead of tea. In some parts of India it forms a portion of the "hunsraj" of the bazaars, which is used as an astringent and aromatic.

Adiantum concinnum, Kth. "Culantrillo," or "jarabe de culantrillo," is much used in the Caracas in pectoral diseases, and said to purify the blood. Six ounces of the fronds are macerated in a gallon of hot water for twenty-four hours, then evaporated to a proper consistence and filtered.

Adiantum fragile, Sw. Named by Lunan as medicinal. Browne says all the species of *Adiantum* are light subastringent vulneraries, and may be administered with great propriety in all relaxations and weaknesses of the fibres, in prurient consumptions and in the ulcerated or relaxed state of the glands, especially those of the breast, as well as in most cutaneous diseases.—*Lunan, Hort. Jam.*, i., p. 475.

Adiantum lunulatum, Spr. The "hunsraj," or "mobarkha," of the Hindoos has been referred to this species. It is employed in India for similar purposes to the maiden-hair of Europe, which latter is known under the name of "gool-i-mairam." Several other species are either mixed with this or substituted for it under the same vulgar name.

Adiantum pedatum, Linn. "Canadian maiden-hair." This is said to be the most esteemed sort of maiden-hair, being more aromatic than the European maiden-hair. It was formerly more employed than at present as a pectoral in chronic catarrhs. Many imaginary virtues have been ascribed to this as well as other ferns.

Adiantum trapeziforme, Linn. "Mexican maiden-hair." One of the numerous species which have been employed for virtues which

they were supposed to possess in common with the true maiden-hair of Europe. It is probably of little or no value.

Adiantum venustum, Don. This is another fern said to yield a portion of the "hunsraj" of Indian bazaars. Considered astringent and aromatic, also emetic in large doses, besides which it is said to be tonic and febrifuge. Employed in Lahore, Kashmir, etc.

Adiantum villosum, Linn. One of the species mentioned by Lunan. Piso is said to have recommended it for expectorating tough phlegm.—*Lunan, Hort. Jam.*, i., p. 474.

Aspidium coriaceum, Sw. Bouton states in his "Medicinal Plants of the Mauritius," that a decoction of this fern is employed in the treatment of tambave; a few cups of this are given during the day, and the residuum left after the decoction is used as a lotion for bathing the neck, breast, and back of the patient at intervals.

Asplenium Adiantum-nigrum, Linn. "Black spleenwort." The medicinal properties of this fern have been extolled by various old authors, but its use is unknown in modern practice. Ray sums up a catalogue of diseases in which it is supposed to be beneficial.

Asplenium nidus, Linn. The tender fronds of this species are cut into pieces in the Mauritius, and form a decoction which is said to be an excellent depurative. The rhizome is also boiled for coughs. Boughton thinks that this is the *Ceterach* mentioned by Dr. Chapotin as employed in Madagascar.

Asplenium radiatum, Sw. According to Dr. Birdwood, the "morpunkhee" of the Hindoos belongs to this species. It is employed locally in medicine, but its virtues are not specially recorded by him.

Asplenium Ruta-muraria, Linn. "Wall rue." Lightfoot says that this fern was at one time sold as an expectorant and deobstruent. It was one of the species employed as a substitute for maiden-hair.

Asplenium Trichomanes, Linn. According to Lightfoot, this fern was formerly used as an expectorant by the peasantry of Scotland. This is another of the many substitutes for the true maiden-hair, now fallen into disrepute. It is the "myle conday" of the Tamils.

Athyrium Filix-femina, Bernh. The rhizome of this fern has been used as a substitute for that of the male-fern, and the same virtues as an anthelmintic have been ascribed to it. It is now generally admitted, however, that these virtues were more supposititious than real, and it has ceased to be employed.

Balanium chrysotrichum, Hassk. Affords the "pakoe kidang" of Java. The hairs are thicker, long, and less soft and silky than those of the "penawar jambie" of Sumatra, but are similarly employed. Some of these fern products, consisting of shining brown hairs, have

been imported into this country, but never came into use. See notice by Mr. Hanbury in *Pharmaceutical Journal* for November, 1856.

Blechnum boreale, Sw. "Hard fern." The rhizome had formerly the reputation of being aperient and diuretic, but has long since ceased to be employed. Its virtues were doubtless imaginary.

Botrychium cicutarium, Sw. Is fancied by the inhabitants of St. Domingo to be an alexipharmic.

Botrychium lunaria, Sw. "Moonwort." Magical properties have been assigned to this fern. Gerarde says, "It is singular to heale green and fresh wounds. It hath been used among the alchymists and witches to doe wonders withall, who say that it will loose lockes, and make them to fall from the feet of horses that grase where it doth grow, and hath been called of them 'martagon,' whereas in truth they are all but drowsie dreams and illusions; but it is singular for wounds as aforesaid." Ray commends its virtues in dysentery.

Ceterach officinarum, Willd. "Rusty spleenwort." Is still employed in Tunis and other parts of North Africa, as well as in Turkey. It was the cetherak of the Persians. At one time it was strongly recommended in this country in jaundice and diseases of the spleen.

Cibotium Barometz, Sw. Yields the "penawar jambie" of Sumatra. It is a similar substance to "pulu," and employed for like purposes. This is the Scythian lamb of old writers, of which such marvellous stories were told.

Cibotium glaucum, Hook. et Arn.; *C. Chamissoi*, Kaulf; *C. Menziesii*, Hook. "Pulu." All these, if really distinct, are natives of the Sandwich Islands, and yield the substance called "pulu," which is the silky hair found clothing the rhizome and lower portion of the stalk or stipes. It has been recommended as a styptic. For further particulars, consult *Pharmaceutical Journal*, 2nd series, vol. i., p. 501.

Davallia tenuifolia, Sw. In the Mauritius this forms the basis of the compound remedies used by empirics for tambave, and is often administered internally in decoction without any admixture, and also in the form of a lotion and bath.

Helminthostachys dulcis, Kaulf. This fern, Dr. Lindley states, is regarded in the Moluccas as a slight aperient; it is used as a pot-herb, and its young shoots as asparagus.

Lastrea athamantica, Moore. Found growing on grassy hills and in moist places near Port Natal. The Zoolu Kafirs, writes Dr. Pappe, who know it by the name of "uncomocomo," use it as a

vermifuge; and its caudex, given in the form of powder, infusion, or electuary, has been proved to be excellent in helminthiasis, and especially in the cure of the tape-worm.

Mohria thurifraga, Sw. Grows abundantly on the Cape Mountains, Cape of Good Hope. When bruised, it smells of olibanum. In some parts of the colony, Dr. Pappe states that the dry leaves are pulverized and made with fat into an ointment, which is cooling and very serviceable in burns and scalds. The vernacular name is "brand-boschjes."

Nephrodium Filix-mas, Rich. "Male-fern." This is one of the few ferns which continue to maintain their character and position for their remedial properties. The rhizome of the male-fern has risen rather than fallen in estimation as an anthelmintic, and as such finds a place in pharmacopœias and in regular practice.

Nothochlæna piloselloides, Kaulf. Has been employed in India to subdue sponginess in the gums, according to Dr. Lindley; but whether still in use we have no evidence.

Ophioglossum ovatum, Sw. This fern, in the Mauritius, enters into the composition of a popular remedy given in tambave.

Ophioglossum vulgatum, Linn. "Adder's-tongue." "The leaves of adder's-tongue," writes Gerarde, "stamped in a stone mortar, and boiled in oyle olive unto the consumption of the juice, and untill the herbes be dry and parched, and then strained, will yield a most excellent greene oyle, or rather a balsame for greene wounds, comparable to oile of St. John's wort, if it do not farre surpasse it by many degrees; whose beauty is such, that very many artists have thought the same to be mixed with verdigrease.

"For them that are with newts or snakes or adders stung,
He seeking out an herb that's called adder's-tongue,
As nature it ordain'd its own like hurt to cure,
And sportive did herself to niceties inure."

Osmunda regalis, Linn. "Royal fern." A native of Europe. The rhizome was formerly employed medicinally, but seems to be of little or no value. It is affirmed to be tonic and styptic, and to have been serviceable in cases of rachitis.

Polypodium calaguala, Ruiz. According to Ruiz, the rhizome of this species constitutes, in Peru, the "genuine calaguala," or "ccallahuala," or "slender calaguala." It is said to possess deobstruent, sudorific, diuretic, anti-venereal, and febrifuge virtues, and is frequently used to thin the blood, promote perspiration, and to mitigate rheumatic and venereal pains.

Polypodium crassifolium, Linn. The rhizome of this species is called "thick calagnala," "puntu-puntu," or "deer's-tongue." It is employed in Peru in the same manner and for the same purposes as the "genuine calagnala."

Polypodium phymatodes, Linn. This is the "male-fern," or "fougère mâle" of the Mauritius. A decoction of the stems is used as an aperient and refrigerant. Mixed with barley and milk, it forms a beverage often recommended by doctors after inflammatory diseases.

Polypodium vulgare, Linn. "Common polypody." This common European fern was at one time in high repute. A decoction of the fronds was formerly administered to children for worms, cold, and whooping-cough. The ancients attributed many virtues to this plant,—Dioscorides, for limbs out of joint, and chaps between the fingers; Pliny, for chaps on the toes; and others, to purge melancholy. It is the "rheum-purging polypody" of Shakespeare.

Pteris aquilina, Linn. "Common Bracken." Native of Europe. The rhizome is said to be astringent and anthelmintic. Lindley says that it has been used with some success as a substitute for hops. Its esculent qualities must be very poor, although it is said to be sometimes eaten. The ancients used rhizomes and fronds, in decoction, in chronic disorders arising from obstructions of the viscera and spleen. It is sometimes employed abroad in dressing and preparing kid and chamois leather.

Scolopendrium vulgare, Sm. "Hart's-tongue." Old herbalists seem to have had great faith in this fern. Lightfoot says that in Scotland it was used by the country people for burns and scalds; and Ray writes of it as applied in the form of ointment to wounds and ulcers. In France it is employed as an astringent in diarrhœa and hæmorrhage.

Undetermined Indian Ferns. Several fern products employed in India have been enumerated, but at present without accurate identification. Amongst these are "iskoolikundrion," a species of *Scolopendrium*; "doonditarus," a species of *Dryopteris*; "surkhus" or "bitarus," probably a species of *Pteris*; and "bisfaij," or "bulookunboon," which is referred to a species of *Polypodium*.

The Development of Ergot. M. C. Cooke. (*Pharm. Journ.*, 3rd series, i., 702). The author writes as follows respecting our present knowledge of this subject:—We will say nothing of the difference of opinion as to the ergot itself being a transformation of the germen, or a parasite of the germen, but start at once with the *Secale cornutum*, as the first stage. In this condition it is called by

botanists a *sclerotium*, and this particular one is *Sclerotium clavus*. What is to be understood by a *Sclerotium*? is a very natural question to suggest itself. It will not do to pass it as a generic name, since it has no value as a genus, and even were it not so, the answer would be insufficient. Fungi are known to be developed in the majority of instances, from certain root-like filaments called mycelia. Sometimes these filaments are very much compacted, and in the present, and some allied instances, assume the form of a compact cellular mass called a sclerotium. So that a sclerotium is, in fact, a compact mycelium, a sort of bulbous mycelium, of variable shape. Such is ergot. Whether produced on wheat, rye or the grasses, this sclerotium differs very little in form, being horn-shaped, whilst other kinds of sclerotium are spherical, discoid or irregular.

The earliest condition of this species is manifested by the presence of a thick gummy matter on the spikes of corn or grass, and this contains granules. During the growth of the sclerotium it is invested by a coating described in detail by Professor Quekett, in a memoir devoted by him to this subject. What the relation is between the gummy matter and the sclerotium and its coating is uncertain, unless it be accepted that the sclerotium is developed ultimately from the base of a spermatogone, which, in the first instance, exuded spermatia in the aforesaid gummy mass. The coating was considered a distinct fungus, parasitic on the ergot, by Quekett, and called by him *Ergotetia abortifaciens*, whilst Berkeley retained it in *Oidium*, with the same specific name. It is now regarded as the spermatiferous condition of the complete fungus. Quekett describes this coating as consisting of minute bodies, which are seen separated from each other, when they are removed from the ergot, but when viewed in their natural situation they are occasionally united by their extremities forming short moniliform filaments, technically "Sporidia (spermatia) elliptical, moniliform, finally separating, transparent, and containing seldom more than one, two, or three well-defined (greenish) granules."*

Another view taken of the relations of the sclerotium with other fungi is, that the species of *Fusarium* described by Nees, under the name of *Fusarium heterosporium*, produces, in its supposed spindle-shaped spores, the *spermatia*, and that the simple bodies produced on the sclerotium (the *Ergotetia* of Quekett, and *Oidium* of Berkeley) are the conidia of the fungus ultimately developed from the ergot. Never having had the opportunity of

* E. J. Quekett, "On Ergot of Rye," etc., *Linn. Trans.*, vol. xviii., p. 453.

watching the growth of the ergot carefully, we shall not venture an opinion on the identity of all the bodies supposed to be connected with the reproduction of this species, and called by numerous names.

The ultimate stage consists in the growth of little stalked bodies with rounded heads from and upon the sclerotium. If ergot of rye, wheat, etc., be slightly covered with soil in spring (March or April), and kept moderately moist with rain-water, in the course of time a crop of these stalked bodies will be produced, but patience is quite necessary, for six months may be required for their growth. These are the *Codyceps purpurea*, or *Claviceps purpurea*, by which name the whole of the forms of this polymorphous fungus should be called. Hence we have the stroma, or compact mycelium (sclerotium), conidia, spermatia, and finally the ascophores containing the sporidia, and all appertaining to *Claviceps purpurea*, Tulasne.

The ascophores, or stalked bodies with globose purplish heads, are minute and delicate, several of them being often produced upon the same sclerotium. The globose head is the fruit-bearing portion. Numerous cells, with distinct walls (perithecia) are immersed in the substance of the head. Each of these cells contains a mass of long, narrow, cylindrical, transparent sacs termed asci, which are thickened at their apices. Each ascus encloses eight hair-like sporidia, flexuous and delicate, slightly attenuated towards each end. This is the final and highest development which the fungus attains. A closely allied species is found on the sclerotium of reeds, and another on the sclerotium of *Eleocharis*; the latter, as far as we are aware, never having been found, except as a sclerotium, in Britain.

This is a brief and rapid survey of the stages in the history of ergot. It would be an interesting and probably instructive experiment, for those who are only acquainted with *Secale cornutum* as one of the articles of materia medica, just to follow the plan we have indicated, and try the cultivation of the sclerotium. It is possible that the examination of the fresh condition of the *Claviceps*, under the microscope, may reveal a phase of vegetable life before unknown to them. Even as a mere curiosity, and nothing more, the labour is but little that is required to grow the ergot-fungus, and should this be successful, an effort might be made to develop the kindred species from the ergot which is so common on *Eleocharis*; the success of the latter effort would add a third species of *Claviceps* to the British list, and this would be some reward for the trouble expended.

PHARMACEUTICAL CHEMISTRY.

PART II.

PHARMACEUTICAL CHEMISTRY.

Chemical Nomenclature of the Pharmacopœia. Professor Ald. (*Pharm. Journ.*, 3rd series, i, 801, 822.) In this paper, was read at a crowded meeting of the Pharmaceutical Society, April 5, 1871, the author discusses those changes which are necessary in order to bring the Pharmacopœial names of chemical substances into better accordance with the present state of chemical science. In doing so, he gives a succinct account of the rise and progress of scientific chemical nomenclature. As this article is likely to excite considerable interest among pharmacutists, we give it together with an abbreviated list of the proposed names:—

Introductory remarks.—The chemical nomenclature of the current Pharmacopœias is mainly scientific, founded on theory, and therefore liable to change. Its one great fault, in relation to medicine and pharmacy, is mutability. A fault, and a great fault, because the life and health of people are largely dependent on the perfect understanding which should always subsist between physician and pharmacist respecting names of medicines which the former prescribes and the latter prepares. But it is a fault which cannot altogether be avoided. For a name is seldom given haphazard; it is commonly selected to express our ideas regarding a thing or substance, and as our ideas are developed and extended, our point of view or theory respecting them necessarily changes; the old name is no longer consistent with our knowledge, and must therefore be also changed. However, there is a limit to the power of language, and desirable as it may be to have a system of names for remedial agents which shall be enduring, abiding, permanent, the production of such a system in the present state of knowledge is altogether impossible. What, then, should pharmacists, medical practitioners and others do when the old names they have accepted on authority are, by the same authority, modified or abandoned? Within the last few years, the hitherto prevailing of the constitution of matter have undergone radical alteration, being no longer consistent with ascertained facts, and the nomenclature or language embodying those views

has, of course, shared the fate of the theories. Under these circumstances, by what principles are we to be guided in adopting for medicine, pharmacy, and the Pharmacopœia, such names as, on the one hand, shall be perfectly explicit, readily understood, unambiguous; and, on the other, consistent, or at least harmonious with prevailing chemical theories as expressed in the educational literature of the science? For not only is it to be remembered that changes must be expected in pharmacopœial names because we have already adopted and employ a nomenclature which, in the nature of things, is liable to change; but we must bear in mind that the successors to men now in practice are learning chemistry by aid of the new hypotheses, and their progress is impeded by old forms of language and by the erroneous notions which that language imparts. This state of things cannot continue; the march of science has ever been aided, never hindered, by medicine or pharmacy. But what position are we to take in respect to this subject? The question is one that demands careful attention. I have endeavoured to answer it myself, and now venture to give to others the train of thought I have followed, and the conclusions at which I have arrived.

Outline of the Paper.—I intend, firstly, to outline the history and present position of the chemical names already employed in Pharmacopœias, especially the British, and to glance at the causes of the recent revolution in chemical nomenclature; and to do so, not by way of aiding the followers of medicine to criticize matters purely chemical, but to enable them to arrive at sound conclusions respecting the application of modern chemical nomenclature to pharmacy. I shall then shortly allude to chemical notation, which is inseparably connected with my subject; mention disadvantages attending alterations in chemical names; state the functions and positive or negative qualities which names should possess; give a complete list of current pharmacopœial names, with the names now proposed, and their scientific synonyms; and finally refer to names requiring special or exceptional treatment.

History and present position of the chemical names of the Pharmacopœia.—The system of nomenclature hitherto accepted from chemists by pharmacists, practitioners in medicine and the public, that which is employed in European and American Pharmacopœias, was mainly suggested by Lavoisier, eighty-four years ago. The fundamental principle on which it was founded was, that the name of a salt should express its composition. The many animal and vegetable substances discovered since that time (notably alkaloids and neutral crystalline principles) are designated, perhaps fortunately, by unsystematic

names, names which, at all events, are not liable to change, and which may therefore be omitted from consideration in this paper. The great majority of chemical substances employed in pharmacy are such mineral salts as were known to Lavoisier, and their names were mostly given on the assumption that they contained, on the one hand, an undecomposable body, generally a metal, common to a whole class of salts (the compounds of *copper*, for example), and on the other, a body, or a group of elements, also common to a number of salts (*sulphates*, for example). Soda, potash, lime, baryta, magnesia and alumina were then considered to be elements; hence, as I shall further show presently, such names as carbonate of soda, nitrate of potash, and sulphate of baryta were perfectly consistent with those of carbonate of iron, nitrate of mercury, sulphate of copper. During the twenty years succeeding 1787, Lavoisier's views of the constitution of salts and the language or nomenclature in which they gradually found expression, were generally accepted throughout Europe. Green vitriol, blue vitriol, Glauber's salt, and gypsum, for example, were considered to contain, on the one hand, the "elements" iron, copper, soda, and lime, respectively, and, on the other, a group of elements common to each of the four compounds; the four different elements were indicated in the spoken and written nomenclature of the compounds by their four names, "iron, copper, soda, lime," while the one group and its presence in each of the four compounds was indicated in the spoken and written nomenclature of the compounds by the word "sulphate;" sulphate of iron, sulphate of copper, sulphate of soda, sulphate of lime. This change from such trivial names as green vitriol, blue vitriol, Glauber's salt, and gypsum to the systematic chemical names sulphate of iron, sulphate of copper, sulphate of soda, sulphate of lime, seems to have been effected without much opposition. At that time comparatively few persons were interested in or affected by the matter, and radical changes of this kind are made with less difficulty by the few than the many. Afterwards it was felt that the multiplication of chemical substances by discovery rendered adherence to a trivial and arbitrary nomenclature impossible, and the adoption of Lavoisier's scientific idea imperative. Lavoisier got the world out of a difficulty, not placed it in one, when he introduced the principle of scientific nomenclature.

Up to 1807 no necessity arose for interfering with the nomenclature of Lavoisier; but in that and the following year Davy made his brilliant researches on the alkalies and alkaline earths, discovered that potash, soda, baryta, strontia, and lime were not elements, as previously had been supposed, but that the true basylous radicals

of the so-called compounds of potash, soda, baryta, strontia, and lime were metals, to which were given the names potassium, sodium, barium, strontium, and calcium. Thenceforward the old names potash, soda, baryta, strontia, lime, were used to designate the oxides of the new metals. Then at once there arose a dilemma in regard to nomenclature. The names of all the salts of Davy's metals were no longer consistent with the names of the salts of all other metals. While on the one hand the names "sulphate of copper" and "sulphate of iron" distinctly expressed the compounds formed by the union of metallic "copper" or metallic "iron" with a common acidulous group of elements, represented by the word "sulphate," the names "sulphate of soda" and "sulphate of lime" as distinctly expressed compounds formed by the union of oxide of sodium and oxide of calcium with a common acidulous radical still indicated by the word "sulphate," but not having the same composition as (having less oxygen than) the similar acidulous radical united with the copper and the iron. It was felt that either such words as sulphate, nitrate and carbonate must each have two significations, and the salts of the alkalies and alkaline earths be considered as compounds of oxides of metals, and all other salts (sulphate of iron, etc.) as compounds of metals, or such words (sulphate, nitrate, carbonate, etc.) must have a common (though an altered) signification, and all oxygen salts be considered as compounds of oxides of metals. Davy, supported afterwards by Dulong, Clark, Graham, Liebig, and Daniell, suggested that *all* metallic salts were composed of metal alone on the basylous side, and a distinct radical on the acidulous side. Unfortunately, however, accurate knowledge of constitution was included in this idea; even definite names being proposed for the said acidulous radicals. Thus blue vitriol was termed oxysulphonide of copper (Daniell), sulphatoxide of copper (Graham), and sulphanide of copper (Otto). Many other objections to the theory arose, and hence salts came to be regarded as compounds of oxides of metals with certain acidulous radicals (now known as anhydrides). But the followers of applied chemistry never took kindly to the nomenclature; such names as sulphate of oxide of iron, nitrate of oxide of silver, acetate of oxide of lead, got shortened to sulphate of iron, nitrate of silver, acetate of lead; a matter of no great moment to any one who had become a chemist, but of considerable importance to every one learning to be a chemist. The names acetate of lead, iodide of lead, etc., logically planted in the mind the impression that the compounds were formed of lead, with the radical of acetates and lead with the radical of iodides,—a

natural idea, which had to be unlearned, and by considerable effort of memory a mere conventional one put in its place, namely, that certain acidulous radicals (iodine, sulphur, etc.) combined with metals, while certain others (anhydrides, formerly called acids) with oxides of metals. Again, that a yellow granular precipitate, caused by the addition of perchloride of platinum to a liquid sometimes indicated potassium and sometimes potash, or that a certain black colouration sometimes indicated lead and sometimes oxide of lead were illogical statements against which the mind naturally rebelled. It is true an explanation was afforded of such anomalies by the assumption that even haloid salts (such as iodide of potassium) on dissolving in water became true salts of oxides of metals (hydriodate of potash); but weighty arguments were adducible against this hypothesis. In short, no theory of the constitution of salts was offered, or has yet been offered, which satisfactorily explains and harmonizes all known facts respecting salts. Hence, when a very few years ago chemists were led by irresistible arguments and stubborn facts to double many of the old atomic weights, an opportunity of abandoning existing constitutional theories then presented itself, and was by common consent accepted. The exertions of Dumas, Laurent, and Gerhardt bore fruit. The dualistic idea of salts being formed of an acidulous radical with the oxide of a metal, and the not less binary notion of their being composed of a distinct acidulous radical united with a metal, were renounced, and hypothesis altogether rejected, or, at all events, restricted to the idea of *oneness*. These views were, of course, accompanied by a commensurate alteration in chemical notation and nomenclature. Blue vitriol, no longer being considered to be the sulphate of the oxide of copper, as shown in the formula Cu O, S O_3 , nor even to have the binary constitution implied in the formula Cu, S O_4 , but to be a structure *per se*, or, at least, one whose detail of constitution was unknown,—it became necessary to devise for it and all such salts a notation and nomenclature which should be consistent with the unitary idea. Strictly speaking, this was impossible. The relationship, nay, the absolute identity of the constituent radicals in whole classes of salts demanded fair representation in notation and nomenclature, a result fatal to pure unitary ideas. Thus, the unquestioned relationship of the cupreous compounds to each other demanded the employment of the word “copper” in their names and the symbol Cu in their formulæ; while the unquestioned relationship of salts containing the elements which occur in the non-cupreous portion of blue vitriol demanded the employment of

the word "sulphate" in their names and the symbols S O_4 in their formulæ, and with the employment of such names and such formulæ the binary idea is difficult to repress. At the same time, all are agreed that the unqualified assumption of knowledge of chemical constitution involved in the old binary theories is wrong, hence professedly binary systems of notation and nomenclature must be relinquished; the names sulphate of oxide of copper, with its formula Cu O, S O_3 , and sulphate of oxide of magnesium (or sulphate of magnesia), with its formula Mg O, S O_3 , must be given up for sulphate of copper Cu S O_4 (or copper sulphate, or cupric sulphate), and sulphate of magnesium Mg S O_4 (or magnesium sulphate). Such names and formulæ sufficiently exhibit unquestioned relationships, while they include the least possible amount of theory.

Chemical Notation.—I would offer a few additional sentences respecting chemical notation. All teachers of chemistry, including the authors of nearly every modern manual, with remarkable unanimity have relinquished the old system of notation, that which was exclusively employed in the British Pharmacopœia of 1864, and have, to a greater or less extent, adopted the new. In the present (1867) Pharmacopœia the new notation is represented by formulæ printed in Egyptian type (K N O_3), the old by formulæ in Roman (K O, N O_3); a course suggested by the unsettled condition of the subject at the time this Pharmacopœia was published. It is to be expected that the next British Pharmacopœia—still "representing accurately, yet with caution, the advancement made in chemistry and pharmacy" (*vide* Preface), and reflecting the settled practice of scientific chemists—will employ the usual chemical symbols as expressive of the new atomic weights ($\text{O}=16$) to the exclusion of the old ($\text{O}=8$), and will altogether discard the hypothesis of the constitution of salts involved in such formulæ as K O, N O_3 , or (accepting the new atomic weights) $\text{K}_2\text{O, N}_2\text{O}_3$, using only the less theoretical formulæ (*e.g.* K N O_3) which are now employed by the majority of teachers. The following formulæ will further illustrate what has just been stated:—

OLD AND NEW CHEMICAL FORMULÆ.

Old Atomic Weights.

	Dualistic hypothesis.	Binary hypothesis.
Nitre	K O, N O	K N O_3
Pearlash (anhydrous) . . .	K O, C O_2	$\text{K}_2\text{C O}_3$
Epsom salt (anhydrous) . .	Mg O, S O	Mg, S O_4
Corrosive sublimate	$\text{Hg Cl}_2 \& \text{Hg Cl}$	$\text{Hg Cl}_2 \& \text{Hg Cl}$

New Atomic Weights.

	Dualistic hypothesis.	Binary hypothesis.	Unitary hypothesis.
Nitre	K_2O, N_2O_5	K, NO_3	KNO_3
Pearlash (anhydrous) . . .	K_2O, CO_2	K_2CO_3	K_2CO_3
Epsom salt (anhydrous) . .	MgO, SO_3	Mg, SO_4	$MgSO_4$
Corrosive sublimate	$HgCl_2$	$HgCl_2$	$HgCl_2$

Old atomic weights—K, 39; Mg, 12; Hg, 200 and 100; N, 14; O, 8; C, 6; S, 16; Cl, 35·5.

New atomic weights—K, 39; Mg, 24; Hg, 200; N, 14; O, 16; C, 12; S, 32; Cl, 35·5.

Little more need be said in favour of the exclusive employment of modern chemical notation in future British Pharmacopœias. Arguments for or against the atomic and other theories and hypotheses concerning the constitution of salts on which this notation is based would be out of place in this paper. The old system is given up by chemists; the new is already officially recognised by the Council under whose authority the Pharmacopœia is issued, and by the various examining Boards, including the Colleges of Physicians and Surgeons, the Society of Apothecaries, and the Pharmaceutical Society, and is adopted in educational works on chemistry.

These are sufficient reasons for justifying us in the expectation of seeing the new notation, if any, alone employed in the third British Pharmacopœia. This much on chemical notation it was desirable to state; for it is inseparably connected with the chemical nomenclature of a Pharmacopœia. Indeed, notation and nomenclature should obviously harmonize, seeing that they are simply different methods of expressing the thoughts and wants of everybody respecting chemical substances. Formulæ are more comprehensive than names, and convey to the mind far more information, but they are intelligible only to the educated chemist. Names comprise less knowledge, but are more or less understood by all, and suffice for general purposes. To formulæ, however, we look to ascertain the views of chemists concerning the constitution of chemical compounds, and it is on these views that chemical nomenclature is founded.

Disadvantages attending Alterations in Nomenclature.—Thus far have I endeavoured to outline the progress of chemistry in those directions which affect chemical nomenclature, those which suggest

modification in the chemical names of pharmacopœial substances. Such names as nitrate of potash and sulphate of magnesia are unwarrantably theoretic and not now current in chemical literature. How can these and similar names be modified, and to what extent must modification be carried? Before answering the question and proposing a modified system of nomenclature, I would allude to (a) the alteration of chemical names as involving disadvantages, and (b) the properties of names. The disadvantages are obvious, unquestionable, and to be avoided whenever practicable. Scientific chemists, those with whom originate new discoveries of specific and generic truths, meet with these difficulties to a very small extent. Modification and extension of mental views respecting the constitution of chemical compounds are necessarily accompanied by modification and extension of the language in which those views are expressed; hence alterations in chemical nomenclature are naturally met with in the original memoirs recording new discoveries. Indeed, altered nomenclature is advantageous, rather than the opposite, while confined to the literature of original research, for it assists the mind in comprehending new truths. But such restriction is only possible for a time. Each additional discovery, whether relating to old substances or new, gives additional impetus to the ever-advancing waves of knowledge, until the old landmarks have to be removed or relinquished, and reconstruction becomes inevitable. Here commence difficulties; for while alteration in language is easy and convenient to followers of pure science, because a natural consequence of altered mental views, it is excessively troublesome and inconvenient to the followers of applied science, who have to entertain the alterations first and the reasons afterwards.

More than this, most serious consequences have sometimes resulted to patients from one medicine being substituted for another, solely through variation in nomenclature. But I need say nothing further on this head; it has already been adverted to at the commencement of this paper, and has been fully and ably treated, either specially or incidentally, by the following writers on pharmacopœial nomenclature:—

PHARMACEUTICAL JOURNAL: Jacob Bell, Dr. Paris, Dr. Pereira, vol. ii., 1st ser., pp. 369-374; Mr. E. Thompson, vol. viii., 1st ser., p. 3; Mr. A. F. Haselden, vol. i., 2nd. ser., p. 112; "C.W.M." and the well-known initials "C. W. Q.," vol. iii., 2nd ser., p. 335; Professor Redwood, vol. vi., 2nd ser., p. 566; in vol. vii., 2nd ser., "On the Vegetable Drugs," by Mr. Daniel Hanbury, p. 96; Mr.

Henry Deane, p. 101; Mr. Proctor, p. 381; Mr. T. Lowe, p. 409; Mr. J. C. Brough, vol. viii., 2nd ser., p. 214; Mr. J. C. Wilson, vol. ix., 2nd ser., p. 363.

Properties of Names.—The names of pharmacopœial chemicals should fulfil certain functions or possess definite qualities, positive or negative, namely,—

1. The name should, as far as possible and practicable, indicate composition. This Lavoisierian principle is, as I have already shown, one of necessity as well as expediency.

2. One name should be associated with only one substance; but the converse I would by no means urge, namely, that one substance should be known by only one name, synonyms being useful both from a theoretical and a practical point of view.

3. A name, even if fallen out of use, should not be transferred to a substance having properties different from the original substance.

4. The name of an official chemical substance, that is, a name officially recognised in national Pharmacopœias, should possess the minimum of instability. This quality is most important. Verbal changes of almost any kind are unpopular; changes in chemical nomenclature have done much to retard the progress of chemistry amongst the people; but changes in the names of pharmacopœial chemicals are objectionable in the interests of medical practitioners, their patients, and pharmacists.

The free employment of Latin and Greek numerals in a chemical name was strongly advocated by the late Professor Miller. But though highly useful in general chemical literature for indicating details of composition, the principle is too dependent on hypothesis respecting atomic values and weights, and too susceptible of disturbance caused by new discoveries, to possess the element of permanence; hence it must be avoided in pharmaceutical chemistry.

5. A pharmacopœial name should admit of being either easily spoken or written, both in the full and in the contracted form, in modern languages and in Latin.

6. When close resemblance between two salts is indicated by identity in all but one of the syllables of their names, that syllable should be at the commencement of the names and not at the end, where it would be liable to be omitted by a prescriber. Indeed, such variations are often indicated with most usefulness by a separate word altogether, confusion and even mischief being thereby avoided. Thus, for calomel and corrosive sublimate the names *subchloride of mercury* and *perchloride of mercury* are greatly to be preferred to *mercurous chloride* and *mercuric chloride*; for a physician, in writing

a prescription, would contract the former to *hydr. subchlor.* and *hydr. perchlor.*, which are still sufficiently distinctive, while the others would *both* be liable to be contracted to *hyd. chlor.*, and a patient perhaps be killed by corrosive sublimate instead of cured by calomel. So *green iodide of mercury* and *red iodide of mercury* are better than *mercurous iodide* and *mercuric iodide*, or *green sulphate of iron* and *persulphate of iron* to *ferrous sulphate* and *ferric sulphate*; any greater precision that may be desired being given by chemical formulæ.

7. A name should not be changed for mere purpose of euphony, real or fancied; thus, chlorhydric for hydrochloric.

8. Names of pharmacopœial chemicals should be consistent with each other.

9. The chemical names employed in pharmacy should be consistent with those used in other branches of applied chemistry, and with the language of scientific chemistry, and general chemical literature. I say consistent, certainly not identical. *For I believe the time has come when, by making a few slight alterations in the terminations of a few of our chemical names, we shall have a system of pharmaceutical nomenclature which, while perfectly harmonious with, is quite independent of, scientific chemical nomenclature, and which therefore contains greater elements of permanence than any yet adopted.* These alterations, be it noted, are in the terminations of the names only; hence the contracted names almost universally used by physicians and pharmacists would in no way be interfered with,—an argument which, if somewhat left-handed, must be admitted to be one of great strength.

The proposed Names.

[The author gives a table of names of all the chemical substances in the British Pharmacopœia; the first column containing the present official name, the second the names now suggested for employment in pharmacy, medicine, and the Pharmacopœia; and the third column containing the unitary names of modern chemistry. We give in the following list only those names in which the author proposes an alteration should be made.—ED.]

The advantages claimed for the proposed names are that they are more consistent with each other than the old; they are formed on one uniform system instead of two; they include less of theory, and therefore have greater elements of stability than the old; and they are harmonious, whilst the old is absolutely inconsistent, with both modern scientific nomenclature and the only chemical notation now

employed. Their newness, so far as they are new, is their only disadvantage, and even this disadvantage, is, in practice, reduced to insignificant proportions.

Column II. also contains a few exceptional alterations, to which I shall allude subsequently.

<i>Old Names.</i>	<i>Proposed Names.</i>
Acetate of ammonia.	Acetate of ammonium.
Acetate of potash.	Acetate of potassium.
Acetate of soda.	Acetate of sodium.
Acid tartrate of potash.	Acid tartrate of potassium.
Ammonio-sulphate of magnesia.	Ammonio-sulphate of magnesium.
Arsenate of soda.	Arsenate of sodium.
Arsenious acid.	White arsenic.
Benzoate of ammonia.	Benzoate of ammonium.
Bicarbonate of potash.	Bicarbonate of potassium.
Bicarbonate of soda.	Bicarbonate of sodium.
Bichromate of potash.	Red chromate of potassium.
Black antimony.	Black sulphide of antimony.
Carbonate of ammonia.	Carbonate of ammonium.
Carbonate of bismuth.	Oxycarbonate of bismuth (syn.).
Carbonate of lime.	Carbonate of calcium.
Carbonate of lithia.	Carbonate of lithium.
Carbonate of magnesia.	Carbonate of magnesium.
Carbonate of potash.	Carbonate of potassium.
Carbonate of soda.	Carbonate of sodium.
Caustic potash.	{ Caustic potash.
	{ Hydrate of potassium (syn.).
Caustic soda.	{ Caustic soda.
	{ Hydrate of sodium (syn.).
Chlorate of potash.	Chlorate of potassium.
Chloride of gold.	Perchloride of gold.
Chloride of tin.	Stannous chloride.
Citrate of ammonia.	Citrate of ammonium.
Citrate of bismuth and ammonia.	Citrate of bismuth and ammonium.
Citrate of iron and ammonia.	Citrate of iron and ammonium.
Citrate of lithia.	Citrate of lithium.
Citrate of potash.	Citrate of potassium.
Citro-tartrate of soda.	Citro-tartrate of sodium.
Dried carbonate of soda.	Dried carbonate of sodium.
Ferrocyanide of potassium (syn.).	Ferrocyanide of potassium.
Hydrated peroxide of iron.	Peroxyhydrate of iron.
Hyposulphite of soda.	Hyposulphite of sodium.
Iodate of potash.	Iodate of potassium.
Magnetic oxide of iron.	Magnetic oxyhydrate of iron (syn.).
Moist peroxide of iron.	Moist perhydrate of iron.
Nitrate of mercury.	Pernitrate of mercury.
Nitrate of potash.	Nitrate of potassium.

Nitrate of soda.	Nitrate of <i>sodium</i> .
Oxalate of ammonia.	Oxalate of ammonium.
Oxide of iron, magnetic.	<i>Oxyhydrate</i> of iron, magnetic(<i>syn.</i>).
Permanganate of potash.	Permanganate of <i>potassium</i> .
Peroxide of iron, hydrated.	<i>Peroxyhydrate</i> of iron (<i>syn.</i>)
Peroxide of iron, moist.	<i>Perhydrate</i> of iron, moist.
Phosphate of ammonia.	Phosphate of ammonium.
Phosphate of lime.	Phosphate of <i>calcium</i> .
Phosphate of soda.	Phosphate of <i>sodium</i> .
Prussiate of potash, red.	? Prussiate of <i>potassium</i> , red.
Prussiate of potash, yellow.	? Prussiate of <i>potassium</i> , yellow.
Subacetate of copper.	<i>Oxyacetate</i> of copper (<i>syn.</i>).
Subacetate of lead.	<i>Oxyacetate</i> of lead (<i>syn.</i>).
Subnitrate of bismuth.	<i>Orynitate</i> of bismuth (<i>syn.</i>).
Sulphate of lime.	Sulphate of <i>calcium</i> .
Sulphate of magnesia.	Sulphate of <i>magnesium</i> .
Sulphate of mercury.	<i>Persulphate</i> of mercury.
Sulphate of potash.	Sulphate of <i>potassium</i> .
Sulphate of soda.	Sulphate of <i>sodium</i> .
Sulphide of ammonium.	<i>Sulphydrate</i> of ammonium.
Tannic acid.	<i>Tannin</i> (<i>syn.</i>).
Tartarated antimony.	<i>Tartrate</i> of antimony and <i>potassium</i> .
Tartarated iron.	<i>Tartrate</i> of iron and <i>potassium</i> .
Tartarated soda.	<i>Tartrate</i> of <i>sodium</i> and <i>potassium</i> .
Tartrate of potash.	<i>Tartrate</i> of <i>potassium</i> .
Valerianate of soda.	Valerianate of <i>sodium</i> .

Résumé.—The chief alterations in pharmacopœial nomenclature now proposed amount to this, that the compounds of the alkali-metals and alkaline-earth-metals instead of being named as hitherto on two distinct systems, should follow but one:—that instead of salts of potassium and of potash, we should have salts of potassium only; instead of sodium and soda compounds, sodium only; and so with preparations of ammonium, lithium, calcium, magnesium, and aluminium. This is a step in the direction of simplicity, and permanency, and away from that of theory.

Synonyms.—Modern scientific chemical names and the old dualistic names should, I think, be included as synonyms of the leading names in all Pharmacopœias.

Exceptional Alterations.—Constitutional objections to the name *acidum arseniosum* would be obviated by the old name *arsenicum album*. Some other bodies, apparently similar in constitution to white arsenic, are alluded to in the text of the British Pharmacopœia as *anhydrous acids*—a most ambiguous and self-contradictory term; for the bodies in question either are acids or they are not acids, whereas the term indicates that they are both—which is

impossible. The not very satisfactory word "anhydride" is coming generally into use for these bodies, and this might be employed officially; but all objection would be avoided if the strength of the pharmacopœial acids, which are mostly aqueous solutions of acids, were solely given in terms of real acid (the hydrogen salt). The correlative of the word *anhydrous*, I would suggest, should be *hydrous*, never *hydrate*; especially as the latter word is now given to the members of a class of bodies derived from water, as *hydrate of potassium*, and not to bodies containing water. The compound from which *anhydrous sulphate of copper* is prepared is *hydrous sulphate of copper*, not *hydrated sulphate of copper*. In view of the peculiar composition of *bichromate of potassium* the first word of its name is most unsuitable, and would be advantageously replaced by *red chromate*, a name which would usefully distinguish the salt from *yellow chromate of potassium*. The names of the bismuth powders are not at present consistent with each other; if the one be termed *subnitrate*, the other should be *subcarbonate*, not "carbonate." But these preparations and the similar compounds of copper and lead are normal rather than "sub" salts, containing oxygen in the place of an exactly equivalent quantity of the acidulous radical of the neutral salts, and might well be termed respectively *oxycarbonate of bismuth*, *oxynitrate of bismuth*, *oxyacetate of copper*, *oxyacetate of lead*; at all events the latter names would do good service as synonyms. Similar remarks apply to the *perozhydrates of iron*. The prefix "sub" is most usefully and indeed indispensably applied in the case of calomel, which is the "lower" or under-chloride of mercury: it would be well if the meaning of the syllable could be always thus restricted to its etymological signification, and never again used in its old conventional sense. The names *tartarated antimony*, *tartarated iron*, *tartarated sodium*, I do not like at all. The sister terms *sulphurated antimony* and *sulphurated potash* are most happy, their utter vagueness fairly representing the nondescript character of the preparations. But *tartrate* (or *oxytartrate*) of *antimony and potassium*, *tartrate of iron and potassium*, and *tartrate of sodium and potassium*, are at least as definite in composition as the citric trio which are already honoured with the definite names (or, rather, with the old forms of the names) *citrate of bismuth and ammonium*, *citrate of iron and ammonium*, and *citrate of iron and quinia*. "Prussiates" might now, I think, be relegated to the synonymic category. Instead of *Liquor Sodæ Effervescens*, B.P., which might possibly be confounded with *Liquor Sodæ*, I would prefer *Aqua Sodæ Effervescens*, and so with *Potash Water*. These

are the prominent exceptional alterations to which I would draw attention. Their acceptance is not insisted on, nor is the list exhaustive. Allusion is made to them in the hope that discussion may show which names, on the whole, possess the greatest number of advantages. The alterations I do urge are those considered in the main portion of this paper, those of which I have already given a *résumé*.

In conclusion, I would state that the Lavoisierian names now proposed for use in medicine and pharmacy, have already been freely adopted by many authors, and used as the leading nomenclature of my own and some other manuals of chemistry. I commend them to the medical practitioners and pharmacists of Europe, America, and the colonies.

Preparation of Hydrogen Gas. (*Journ. Chem. Soc.*, 2nd series, ix. 166.) It is stated that MM. Tessié du Motay and Maréchal have lately discovered a new and economical method of producing hydrogen gas. The process consists in heating the hydrates of the alkalies and alkaline earths with coke, coal, charcoal, etc., to a red heat, whereupon carbonic acid and hydrogen are given off abundantly; and as the decomposed hydrates, especially that of lime, can be used indefinitely, by simply remoistening them with water, the method is very economical. In this operation the hydrogen gas is generated without any special production of steam, and may thus be produced without any other generating apparatus than the retorts themselves; and as these retorts are not exposed to the direct action of the steam, they are not subject to any interior deterioration. This process, it is said, in conjunction with the method of obtaining cheap oxygen from the manganates of soda, discovered by the same chemists, is likely to create a revolution in many industries, and especially in metallurgy.

The Ammonium Carbonates. E. Divers, M.D. (*Journ. Chem. Soc.*, 2nd series, ix., 171.) This elaborate paper, occupying 108 pages of the *Chemical Society's Journal*, embodies the results of a most exhaustive investigation into the composition and constitution of the compounds formed by carbonic anhydride, ammonia, and water. The author obtains four distinct and well-defined carbonates of ammonium which may be crystallised from solution, namely:—

- I. Normal ammonium carbonate.
- II. Half acid carbonate.
- III. Acid ammonium carbonate.
- IV. Rose's carbonate.

The preparation, composition, and properties of these are described

in detail, followed by some theoretical considerations upon the constitution of these bodies. The normal carbonate has not been hitherto generally known in the isolated condition; its description therefore, possesses especial interest.

The next section treats of ammonium carbamate, which we now learn, contrary to previous anticipation, may be formed in presence of water. The carbonate of ammonia of commerce is then studied, and a corrected composition assigned to it, the formula hitherto adopted being now incorrect. The remainder of the paper is devoted to the products obtained by the sublimation of the carbonates of ammonium.

The following paragraphs are abstracted from the author's memoir, and contain the most important results of his investigations:—

I. NORMAL AMMONIUM CARBONATE.

Preparation.—Ammonium carbonate may be prepared in various ways, which all depend for their success upon either the hydration of the carbonate, the combination of ammonia and water with the acid or half-acid carbonate, or both of these actions.

(a) By digesting in a closed flask the commercial carbonate, crushed small, with strong solution of ammonia for two hours, or not much less, at a temperature not exceeding 12° C., or thereabouts, the ammonium carbonate is left as a mealy, obscurely crystalline mass. It is to be dried by pressure between folds of bibulous paper; this operation, after most of the mother-liquor has been absorbed by a few changes of paper, being conducted in a chamber as small as convenient, and as far as possible filled by the salt and the paper used to dry it, every care at the same time being taken to expose it as briefly as possible to the free action of the atmosphere in this stage of the drying. The operation is practically complete when the salt no longer makes distinct wet marks on the drying-paper, though it will then still feel damp. If, when the drying is nearly finished, the salt is found to be firmly adhering to the paper when a change is made, the operation has been so performed as to allow of decomposition taking place, through insufficient exclusion of air, either by having adopted imperfect means for protecting the salt while it was between the folds of paper, or by having made the changes of paper too slowly or too many times. In warm weather it is well to surround the chamber with ice.

(b) By digesting the commercial carbonate (or any other carbonate) of ammonium with strong solution of ammonia in a closed vessel, at a temperature of 20°–25° until it is dissolved, and leaving

the solution thus obtained in a cool place, with the vessel containing it not thoroughly closed, in order that some of the ammonia may escape, when minute crystals form, converting it at first into a semi-transparent magma, but afterwards becoming distinct, interlacing, slender prisms. One part of the commercial carbonate to four parts by weight of the strong solution of ammonia is a convenient proportion in which to take them. The digestion generally takes about two days. It may happen when the ammonia has not been allowed to escape, and the quantity of carbonate which has been added is relatively great, that a few larger crystals, having quite a different appearance to the others, will form; when this is the case, the solution must be warmed until these crystals have dissolved, and at the same time some ammonia be allowed to escape, and then, on again cooling it, these crystals will not reform. On the other hand, when by prolonged digestion at a gentle heat, a very large quantity of the commercial carbonate has been dissolved in the strongest ammonia water, fortified occasionally by the passage of ammonia gas in the cold, the solution only yields the ammonium carbonate with difficulty, until most of the ammonia has been allowed to escape from it by keeping it in an imperfectly closed vessel, and the crystals are then often large flattened prisms. In separating minute crystals of ammonium carbonate from their mother-liquor and preparing them for analysis, the same plan is to be adopted as in the previous method. The preparation is somewhat more manageable than the preparation of the mealy form, and the presence of the crystalline lustre serves as a means of testing its success.

(c) By passing ammonia through a strong solution of the commercial carbonate until it becomes charged with the gas, when crystals of the ammonium carbonate, similar to those produced by method (b) will form in a small quantity, either while the gas is passing, if the solution be kept cool, or afterwards, on allowing the solution to stand in a closed vessel in a cool place.

(d) By dissolving a sufficient quantity of the commercial carbonate in warm, dilute solution of ammonia, best in a closed or nearly closed vessel, when ammonium carbonate crystallises out on cooling. If the free ammonia be present in large quantity, the crystals are small; if it be present in very small quantity only, the salt next to be described crystallises out; while if it be present in not much more than sufficient quantity to prevent this, the crystals of ammonium carbonate are large. This is one of the best methods for getting large crystals.

(e) By adding dilute spirit to a solution of commercial carbonate

in ammonia-water (or to any solution equivalent to this, prepared in any other way), in quantity somewhat less than enough to cause a precipitate, when the ammonium carbonate slowly crystallises out in long flat prisms. As with the last method, the size of the crystals is generally less in proportion to the quantity of free ammonia. When strong spirit is added to a concentrated ammoniacal solution of the carbonate, the whole soon partially solidifies through the formation of minute crystals of ammonium carbonate, large prisms sometimes shooting across the mass, when the mixture is not too strong in free ammonia.

(f) By dissolving ammonium carbonate in sufficient quantity in water at a gentle heat (30° – 35°) in a closed vessel; when on cooling the solution, and standing it aside for some time, a little ammonium carbonate crystallises out.

(g) By dissolving ammonium carbonate in sufficient quantity in strong ammonia solution at the ordinary temperature, in a closed vessel, and setting the solution aside with the vessel only imperfectly closed, that ammonia may slowly escape, when ammonium carbonate crystallises out.

(h) By passing carbonic anhydride into strong ammonia-water for some time, taking care to leave large excess of ammonia, and setting the solution aside in a closed vessel, when the carbonate separates in small, usually minute, crystals.

(i) By dissolving good commercial carbonate, crushed small, in water at a gentle heat, best in a closed or nearly closed vessel, setting the solution aside to cool and crystallise, decanting the mother-liquor on to a fresh quantity of commercial carbonate, again effecting solution by heat, cooling, and crystallising, a second time decanting the mother-liquor, and so on, repeating these solutions and crystallisations a sufficient number of times, when, according to the extent to which the water has been treated with the commercial carbonate, either the last solution, after depositing crystals for one or two days, will, on being decanted and left for a further time in a closed vessel in a cool place, deposit large prismatic crystals of ammonium carbonate, or the solution will, in one night's crystallisation, form over the first crop of crystals a second of the ammonium carbonate, and continue for some time to yield more of this substance. If, instead of waiting for the solution to crystallise, it be treated with ammonia-water, a precipitation of minute crystals of the salt will take place and convert the whole into a semi-solid mass. This and method (d) are the best for obtaining large crystals. The crystals are relatively short and broad when this solution is allowed

to crystallise slowly at medium temperatures ; but when the solution which has thus been left standing for some days is exposed to the sky for a night in clear cold weather, long flat prisms generally form.

Sensible Properties.—Ammonium carbonate gives out an exceedingly strong ammoniacal odour, due, presumably, not to itself, but to ammonia as a product of its decomposition. It has an extremely pungent taste, and at once affects the tongue as a caustic to a marked degree.

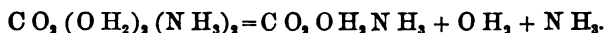
Form.—Ammonium carbonate takes the form of elongated plates or flattened prisms. When large crystals are formed by slow growth, they are so broad in proportion to their length, that they can hardly be described as prisms. But when large crystals are produced in a single night, they are often of great length, shooting across the solution like nitre crystals. One of these was measured, and found to be 50 m.m. long, 6 m.m. broad, and about 0.5 m.m. thick. Crystals growing over the bottom of the vessel take the broad, short, tabular form, while those produced in the body of the solution assume the slender, flat, prismatic form. When solitary crystals are first seen suspended in the solution, they have a narrow breadth, no sensible thickness, and a considerable length relatively to their minute bulk, and are hardly, if at all, visible, except when in a position to reflect light to the eye from one or other of their broad surfaces. A very small absolute bulk of such crystals is sufficient to convert the whole solution into a semi-transparent magma, forming, as they do, equally through all parts of it. When they are very minute, and in not too great quantity, the network they form can be shaken, by gently jolting the vessel, into a smaller hulk, retaining more or less the shape of the interior of the vessel. Violently shaken up, they subside afterwards to the lower part of the vessel. When the solution filled with these crystals is left undisturbed, the crystals grow, and form a closely interlacing network of slender, apparently four-sided prisms.

Chemical Composition.—The author gives the results of analysis of all these different forms of this salt. The results are very concordant, and correspond to the formula



Behaviour on Exposure.—Ammonium carbonate gets very damp when exposed to the air. Before crystals of the ammonium carbonate can be dried, they lose their lustre, and become semi-opaque and moist, but retain their general shape ; when pressed, they break

down to a mass of wet acid carbonate. This change is not the result of absorption of moisture from the air, but of the instability of the salt in an atmosphere not charged with the products of its own decomposition; for the action goes on in a stoppered bottle until the air in the bottle is thus affected, and the salt is wet. The change may be thus represented:—



It is because of this evolution of moist gas that a feeling of dampness in the paper used to dry the salt, must not be regarded as proof that some adhering moisture has not been removed from it.

Behaviour with Water.—Ammonium carbonate is soluble in its own weight of water, or slightly more, at 15°. By cooling the solution contained in a closed vessel, some of the salt crystallises out again, but mixed with other carbonates.

The saturated solution is of somewhat oily consistence. It smells very strongly of ammonia. Exposed freely to the air, it loses ammonia. Heated, it begins to effervesce between 70° and 75°, and boils freely between 75° and 80°, yielding vapours which condense into a moist solid. After boiling for a while, and when cooling the solution, it is found to be unchanged in properties, except that it is weaker.

A warm saturated solution of ammonium carbonate exhibits the phenomenon of supersaturation and sudden crystallisation in a well-marked manner when it is allowed to cool in a closed flask. If the solution does not crystallise while left at rest, it will do so suddenly on stirring it with a glass rod or pouring it out into another vessel.

Behaviour with Alcohol.—Ammonium carbonate is insoluble in alcohol. Crystals of it treated with rectified spirit are converted into acid carbonate and pure ammonia. An aqueous solution of it is precipitated by alcohol, the precipitate being acid carbonate, or intermediate in composition to this and normal carbonate.

Behaviour with Ammonia-water.—Ammonium carbonate dissolves in ammonia-water only very sparingly at a low temperature, but by digestion at ordinary temperatures, the quantity dissolved becomes greater. Strong ammonia-water, added to a concentrated solution of the carbonate, precipitates it unchanged. Ammonia gas passed into a moderately strong solution has the same effect. In cases where no precipitate is produced, the mixture will generally deposit some of the salt when cooled in ice. The small solubility of ammonium carbonate in ammonia-water is a fact which is most serviceable in preparing it. Thus nearly all the methods already given,

including, perhaps, that in which the salt is precipitated by spirit from a weak ammoniacal solution, depend upon this influence of ammonia. But ammonia has a much more remarkable effect upon ammonium carbonate than that described in the last paragraph. It is capable, under suitable conditions, of converting the carbonate into carbamate, as will be explained further on.

II. HALF-ACID AMMONIUM CARBONATE.

The author refers to the methods of Rose and Deville for the preparation of this salt in crystals, and describes the details. He also gives the following process:—

A concentrated solution of commercial carbonate in warm water is made in a loosely-closed vessel, and left to crystallise. The operation is repeated again and again with the mother-liquor and more of the carbonate of commerce, until in place of the compact crop of crystals at first obtained, a bulky and loosely arranged crop of thin plates is produced; this, and those succeeding it, are crops of the half-acid carbonate.

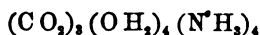
By using not too great a charge of commercial carbonate, and allowing the crystallisation to go on, in a place not too cold, crystals form, and grow slowly to a considerable size; or large crystals may generally be obtained by decanting the mother-liquor, after twenty-four hours standing, off the first or second crop of half-acid carbonate, and leaving it undisturbed in a closed vessel for some weeks.

A modification of this method is, to heat some commercial carbonate in a retort with just enough water to cover it, at a temperature not exceeding 60°, until all is dissolved, then cooling the solution and setting it aside to crystallise, when it yields the half-acid carbonate mixed with acid carbonate.

Sensible Properties.—Half-acid ammonium carbonate has a very pungent ammoniacal taste and smell, but the pungency is less intense and persistent than that of the normal carbonate.

Form.—It occurs in the form of thin, elongated, six-sided plates; or when these plates are left to grow in their mother-liquor, of flattened right rectangular prisms, terminated by the faces of a rhombic octohedrons.

Chemical Composition.—The author gives the results of analysis of a number of examples of this salt, from which he deduces the formula:—



as correctly representing the composition of the crystals. In the

vious investigations of Rose and Deville, the formula deduced contained an additional atom of water.

III. ACID AMMONIUM CARBONATE.

Preparation.—(a) By exposing the commercial carbonate, the f-acid carbonate, or the normal carbonate to the air, when the d carbonate is left in the mealy condition.

(b) Also by exposing ammonium carbamate to the air, when a le of the acid carbonate is formed and left behind in the mealy idition.

(c) By treating the commercial carbonate or the half-acid carbonate with insufficient water to dissolve it, when the acid carbonate left in the mealy condition. By treating similarly the normal bonate, a very little acid carbonate seems also to be formed.

(d) By treating the commercial carbonate, half-acid carbonate, or rmal carbonate, with aqueous alcohol, when the acid carbonate is t in the mealy condition.

(e) By forming a sufficiently strong solution in water of the commercial carbonate, or the half-acid carbonate, and then reducing the perature, when the acid carbonate crystallises out.

(f) By adding alcohol to an aqueous solution of the commercial bonate, the half-acid carbonate, or the normal carbonate, when acid carbonate deposits in crystals.

(g) By treating an aqueous solution of the commercial carbonate, half-acid carbonate, or the normal carbonate, with carbonic hydride, when the acid carbonate crystallises out.

Sensible Qualities.—Acid carbonate has a cooling, saline taste, free m ammoniacal character until it has been retained in the mouth a short time. It has no smell when dry; when damp, it smells ammonia.

Form.—It occurs in the form of powder, in crystals, transparent opalescent, obtained from water; and in crystalline semi-transparent cakes.

The latter are produced by slow distillation, and exactly resemble ll-crystallised specimens of the commercial carbonate. This form the acid carbonate sometimes occurs in commerce, associated with e ordinary commercial carbonate.

The author has repeatedly analysed this salt, the acid carbonate, epared in various ways, and has always obtained results closely rding with the composition $\text{NH}_4\text{H}_2\text{O}_2\text{CO}_3$.

Behaviour on Exposure.—It is probably quite fixed in dry air. ordinary air it is very slowly dissipated, as was pointed out by

Dalton. According to John Davy, it is decomposed by the atmospheric moisture, and rendered alkaline. Certainly, the moister it is, the more ammoniacal it renders the air confined with it in a bottle. By exposure to air, the faces of the crystals lose much of their lustre. It is not quite easy to recognise the nature of the change which the salt undergoes by exposure: for example, when the salt has been left for a while in a closed bottle, how is the strong smell of ammonia which is generated to be accounted for? What has become of the carbonic anhydride that was in combination with it?

Behaviour when heated.—Like the normal carbonate, when heated in a retort, a little of it is first decomposed, and yields a few drops of liquid distillate, at about 49° C., which gradually crystallise in needles; while the rest, getting thus enveloped in an atmosphere of the products of this decomposition, undergoes no change at this heat. At about 60° it is slowly decomposed into carbonic anhydride, water, and ammonia. As already described, these three substances re-form the acid carbonate in the cool part of the retort, and the salt in the retort remains dry. When the heat is carried much above 60° C., the salt remaining in the retort gets wet; a moist solid, having no longer the composition of the acid carbonate, forms in the cool part of the retort-neck, and carbonic anhydride escapes. The nature of this solid distillate will be considered along with that of the products obtained by distilling the normal carbonate and of other products of distillation.

Behaviour with Water.—As was first pointed out by Berthollet, the acid carbonate dissolves in about eight parts of water, at 15° C. By exposure to the air, this solution rapidly loses carbonic anhydride; but, as also pointed out by Berthollet, this loss is soon arrested. Gently heated, it effervesces. The solution placed in contact with solid acid carbonate decomposes it, even at low temperatures, large bubbles of carbonic anhydride being formed, as was pointed out by Davy, which adhere to the crystals, and, if the latter are small, carry them to the surface. A saturated solution of acid carbonate crystallises out when cooled. A solution of the acid carbonate, when heated in a retort, first evolves carbonic anhydride, and then a distillate of normal carbonate (Berthollet), and lastly, one of pure water.

Behaviour with Alcohol.—Acid carbonate is in reality very slightly, if at all, acted on by strong aqueous spirit, cold or boiling. In the cold, the spirit, after digestion, contains a very little caustic ammonia; while a few bubbles of gas, presumably carbonic anhydride,

are found entangled among the crystals of the salt. The crystals boiled with the spirit are slowly decomposed, as they would be by the heat alone; carbonic anhydride and ammonia escape, and the remaining spirit is left weakened, with a little caustic ammonia dissolved in it.

IV. ROSE'S CARBONATE.

A salt in beautiful crystals was obtained by Rose from an aqueous solution of the commercial carbonate, which yielded a smaller proportion of ammonia than that of one atom to one of carbonic anhydride. Rose found its preparation very uncertain, and only succeeded very rarely in getting it. He obtained it by evaporating the solution of commercial carbonate in a partial vacuum over oil of vitriol, taking care to avoid the production of ebullition in the solution, as this is attended with the formation of the ordinary acid carbonate. He observed that the salt soon changed into the ordinary acid carbonate, when it was left exposed over the oil of vitriol after it was formed, and that it also underwent this change, though more slowly, in whatever way attempts were made to preserve it, the change being marked by efflorescence.

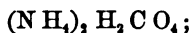
The author fully admits the possible existence of this salt, although he has not succeeded in preparing it, but rejects the formula proposed for it by Rose, and considers that its composition is most correctly represented as $(\text{N H}_3)_4 (\text{H}_2 \text{O})_4 (\text{C O}_2)_5$.

CONSTITUTION OF THE CARBONATES OF AMMONIUM.

Admitting the existence of Rose's salt, we have the following series of carbonates of ammonium which crystallise from their solutions :—

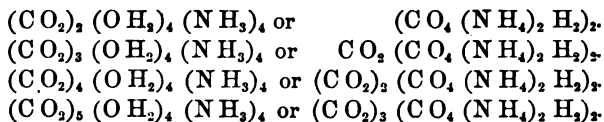
Normal carbonate	$(\text{C O}_2)_3 (\text{O H}_2)_4 (\text{N H}_3)_4$.
Half-acid ditto	$(\text{C O}_2)_3 (\text{O H}_2)_4 (\text{N H}_3)_4$.
Acid ditto	$(\text{C O}_2)_4 (\text{O H}_2)_4 (\text{N H}_3)_4$.
Rose's ditto	$(\text{C O}_2)_5 (\text{O H}_2)_4 (\text{N H}_3)_4$.

If instead of regarding carbonic acid as a dibasic acid $(\text{H}_2 \text{C O}_3)$, it be viewed as tetrabasic $(\text{H}_4 \text{C O}_4)$, then the foregoing normal carbonate becomes the half saturated salt of the tetrabasic acid :



and, following out this view, the author regards the remaining

members of the series as compounds of this salt with one, two, and three atoms respectively of carbonic anhydride.



The regularity of this series, which includes all the carbonates of ammonium yet obtained crystallised from solution, is remarkable, and favours the theory that the half-acid, acid, and hyper-acid carbonates are anhydro-compounds of the normal carbonate.

AS TO THE EXISTENCE OF A NORMAL ORTHO-CARBONATE OF AMMONIUM.

If the normal meta-carbonate can really be considered to be an acid ortho-carbonate, then a normal ortho-carbonate, that is, a salt having the formula $\text{C O}_4 (\text{N H}_4)_4$, may be supposed to exist. Evidence of its probable existence is not altogether wanting.

AMMONIUM CARBAMATE, $(\text{N H}_3)_2 \text{C O}_2$.

Preparation.—(a) By the direct union of dry ammonia and carbonic anhydride gases, when it is deposited partly as an incrustation on the walls of the vessel in which it is formed, and partly as flocculi. This is the earliest method known.

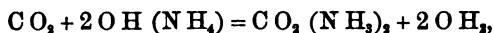
(b) (Rose's method.) By distilling together ammonium sulphate and anhydrous sodium carbonate; when it is also obtained as an incrustation on the walls of the condensing vessel.

(c) (Kolbe and Basaroff's method.) By passing carbonic anhydride and ammonia gases, both perfectly dry, into cold absolute alcohol, separating the copious crystalline precipitate by filtration from the greater part of the liquid, and heating it with absolute alcohol in a hermetically sealed tube to 100° or above, when the liquid on cooling deposits the carbamate in large crystalline laminæ. The author has added to these processes several others made out by himself.

(d) By passing carbonic anhydride and ammonia gases into concentrated aqueous solution of ammonia, when the carbamate separates in crystals, which, when dried as well as possible by pressure between folds of bibulous paper, contain only a little carbonate. The details of the operation are as follows :—A wide-mouthed short-

flask or bottle, fitted with a perforated vulcanised stopper, in which two glass tubes pass, is half-filled with the strong solution of ammonia of commerce, and placed in a vessel of cold water, or, preferably, ice. Carbonic anhydride gas, which has been passed through oil of vitriol, is then sent into the ammonia-water by means of the leading tubes, pushed down nearly to the bottom of the solution. No fear of the ammonia passing up the tube by absorption need be felt, so long as the stream is not exceedingly slow. A stream of ammonia gas—by preference, partly or completely dried—is then sent into the solution by the other leading tube, also dipping nearly into the liquid. The flow of the ammonia is regulated to suit the absorption of it that takes place by the liquid. The carbonic anhydride is not absorbed at first much more rapidly than it would be by water, and even after a while, when its rate of absorption has considerably increased, it can still be sent through the liquid to the surface with ease; this it is advantageous to do, as its absorption is complete at the surface of the solution, unless it is sent into it in a very large quantity. When the solution is kept cool by ice, very little incrustation forms on the sides of the bottle above the liquid, but when the solution is not kept cool, thick incrustation is formed. The carbamate soon precipitates in small crystals in the cold solution, but in the warm solution this does not take place for some time. This, however, is only because the carbamate is more soluble in the warm liquid; for it crystallises out on the cooling of the solution. But, as the carbamate more easily combines with water when in solution, it is desirable to keep the solution cool, so that it may be precipitated as soon as possible after it is formed. When the solution containing precipitated carbamate is allowed to grow warm, the greater part or all of the carbamate re-dissolves, but separates again on cooling. A little normal carbonate usually separates along with the carbamate. This can be partly separated from the heavier crystals of the latter by decanting the solution, after agitation, from the carbamate, before much of the carbonate has had time to settle down. The incrustation on the sides of the bottle is also carbamate, but more contaminated with carbonate. The crystals of carbamate are strained off and pressed in a calico filter, and then dried by pressure between folds of bibulous paper. They cannot be obtained quite dry. They are to be stored in a closely-stoppered bottle, and during the first few days they must be shaken about, or otherwise they will cake together, by slowly uniting with the adhering moisture, to form carbonate. The stopper must also be turned occasionally, as it is very apt to get cemented into the bottle by a little carbonate forming

between it and the neck. The yield of carbamate by this process is good, but the carbamate is never very pure, having some carbonate formed along with it during its preparation, and more afterwards from the moisture which always adheres to it. It is worthy of notice that in this process we have an exact imitation of the process (c) employed by Kolbe and Basaroff, only that concentrated ammonia-water is employed, instead of absolute alcohol. The formation of the carbamate in this way is interesting also from the light it throws on the nature of aqueous ammonia; for, unless it be maintained that carbonic anhydride resolves an ammonium hydrate into ammonia and water, thus—



ammonia solution cannot be considered to be a solution of ammonium hydrate.

(e) By digesting in a closed vessel an aqueous solution of ammonia, saturated with the gas at a low temperature, with either the commercial carbonate, or any other carbonate of ammonium, at a temperature of 20°–25° for thirty-six or forty hours, when the carbamate either crystallises out at once on cooling, or will do so after cooling the solution, passing more ammonia gas into it, adding more carbonate, repeating the digestion as before, and then again cooling. This process has been already described in the account of the reactions of the normal and acid carbonates. The best carbonate to employ is the commercial carbonate, because it yields more of the carbamate, as might be anticipated from its composition. The crystals are the same as those obtained by process (d), but usually much larger. Large crystals can be obtained almost perfectly dry, and quite free from admixture with the normal carbonate (which is always formed with the carbamate by this method, though in very small quantities).

(f) By heating the commercial carbonate of ammonia, mixed with a sufficient quantity of anhydrous potassium carbonate, in a retort, immersed in a water-bath at a temperature carried slowly from about 50° to about 80°, and connecting the neck of the retort with a wide tube dipping under mercury, when the neck of the retort becomes incrustated with the carbamate in a translucent crystalline condition. The water-bath is to be maintained at a temperature not much exceeding 60° C., until ammonia gas, which is at first generated in large quantities, has nearly ceased to escape through the mercury. The temperature of the bath is then to be raised, but not so rapidly as to cause any material escape of gas through the mercury. The potassium carbonate is to be freshly ignited, and in powder, and to

be mixed with less than its bulk of the commercial carbonate, in good condition, and crushed small, and the mixture covered with a layer of the potassium carbonate. To obtain the carbamate, the neck of the retort is to be cut off and broken up, and the carbamate chipped from the fragments. If the neck of the retort is kept cool by special means, the carbamate is formed more rapidly than if these means are not employed; but it is then not so crystalline, and adheres with such increased firmness to the glass, that much time is spent in detaching it, during which it is absorbing moisture. The carbamate has not been obtained quite pure by this process, but it has been markedly purer than the carbamate obtained by Rose from the mixed dried gases.

(g) By distilling, as in the last process, a mixture of the commercial carbonate of ammonia and anhydrous calcium chloride, when an incrustation forms, similar in every respect to that obtained in the last case, which is the carbamate. At a temperature of the water-bath of about 48° a considerable quantity of carbonic anhydride escapes through the mercury; and at about 52° the incrustation begins to form, and continues to do so with very little further escape of gas; while the temperature is allowed to rise very slowly to 65° , a temperature which is sufficient to carry the process to its completion. The calcium chloride used is to be in as fine a powder and as nearly anhydrous as possible; and it must be used in considerable excess, as particles of it are only acted on superficially. The mixture with the carbonate can be effected by shaking the two powders in a stoppered bottle, so as to avoid unnecessary exposure to the air.

The author has used of the calcium chloride from one-and-a-half to three times the weight of the carbonate, and generally reserved some of it to cover over the mixture of the carbonate with the rest. The carbamate is generally very nearly pure, provided sufficient anhydrous calcium chloride has been used. When not very pure, it can be rendered almost perfectly so by distilling it off fresh calcium chloride. The yield of carbamate is less than that by the previous process.

(h) By distilling the commercial carbonate extremely slowly, when the more remote part of the earlier formed incrustation will be found to be impure carbamate. Samples were obtained from an incrustation thus prepared, in which six-sevenths and five-sixths respectively of the contained ammonia, were in the state of carbamate. There are no sensible qualities by which the composition of the product can be inferred; so that it is quite possible, indeed more probable than not, that parts of the incrustation were more nearly pure carba-

mate than the samples selected for analysis proved to be. This process is, of course, only of interest from a theoretical point of view.

(i) By distilling the normal carbonate at a heat not exceeding 60°, when a solid condenses containing even less water than the product of method (h). It is probable that the pure carbamate is really formed at first, its hydration being a secondary matter.

(j) By repeatedly dissolving commercial carbonate at a gentle heat in the same quantity of water, cooling after each addition, and separating the crystals, as already described, until crystals of normal ammonium carbonate are deposited; then once more warming the solution, dissolving a fresh quantity of commercial salt in it, allowing it to cool and crystallise for a day, separating the crystals, passing ammonia gas, straining off or not (as may be necessary) the precipitate of normal carbonate produced, renewing or continuing the stream of ammonia till the solution (kept cool) is about saturated, and straining off the precipitate of normal carbonate,—when the solution will prove by its reactions to be apparently a solution of carbamate with a little carbonate dissolved in it. It is not unlikely that by carrying this process further, with some modification, crystals of carbamate might be obtained; but no experiments were made in this direction.

(k) By distilling the commercial carbonate with strong spirit, or, probably better still, with absolute alcohol. The carbamate is wet,—mixed with water and spirit,—but contains very little carbonate.

Sensible Qualities.—Ammonium carbamate has a strong smell of ammonia, but not at all equal to that of the normal, or even half-acid, carbonate. As regards its taste also, it is strongly ammoniacal, but without the causticity of the normal carbonate.

Form.—It occurs in the form of flocculi; of an incrustation more or less crystalline; of prisms found sometimes projecting from this incrustation; of crystalline laminæ (Kolbe and Basaroff); and of crystals, neither tabular nor decidedly elongated or columnar.

Behaviour on Exposure.—It evolves an odour of ammonia, which when a solid lump of it, or a crystal, is exposed freely to the air, rapidly diminishes in intensity; at the same time the carbamate gradually deliquesces; by continuing the exposure it is nearly dissipated. The residue left is acid carbonate, generally in the form of a porous cast or superficial skeleton of the original fragment. This is best seen with the carbamate obtained by distillation; while the deliquescence is best seen in the crystals deposited from solution, but not to an extent suggestive of any difference in the two forms of carbamate. According to some writers the carbamate is entirely

dissipated by exposure; according to others it leaves, as the author has himself observed, a little acid carbonate.

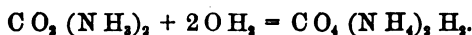
The deliquescence of the carbamate is an interesting fact, not only as affording further evidence that the carbamate has only a slowly-manifested chemical affinity for water, but also as distinguishing between the mere physical attraction of a body for water, and its chemical transformation with water into a new substance.

To observe the deliquescence of the carbamate, the exposed fragments or crystals should be pressed after about an hour's exposure, when a superficial film of acid carbonate, which gives the appearance of dryness and solidity to it, is broken through, and a drop of fluid forced out. That this deliquescence is not accompanied by any material chemical hydration of the carbamate, is shown by the fact that a little acid carbonate is left on further exposure, which would not be the case if ammonium carbonate solution were left to dry up.

Behaviour when Heated.—Ammonium carbamate, unlike the true carbonates, does not fuse when heated. According to John Davy it is converted into gas at 60° C. The author's experiments very nearly confirm this statement. He was not able to fix the point very closely, but found it to be about 59°.

When carbamate is converted at any temperature into gas or vapour it appears to be decomposed into carbonic anhydride and ammonia. Dissociation in fact occurs but, on cooling, the gases again unite to reproduce the original substance.

Behaviour with Water.—One part of ammonium carbamate dissolves in about one-and-a-half parts of water, sensible cold being produced by the solution. It dissolves unchanged, as is shown by the reactions of the solution immediately after it is prepared. But the carbamate in solution soon combines with water and becomes carbonate, according to this equation:—



Behaviour with Alcohol.—Ammonium carbamate is soluble in spirit of sp. gr. 829, according to John Davy. In absolute alcohol, when heated with it in a sealed tube, it dissolves, and crystallises out when the solution is allowed to cool (Kolbe and Basaroff).

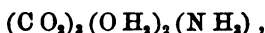
Behaviour with Ammonia-Water.—It dissolves freely in the strong ammonia-water of commerce, with production of cold. At 15° one part dissolves in a little more than two parts of the ammonia-water. The solution, left to itself for some time, yields crystals of the normal carbonate. But when cooled down to about 0° soon after it

is made, it yields the carbamate again in relatively large crystals. Ammonia therefore has the power, well marked, of impeding the hydration of the carbamate. To this fact is probably due the success in obtaining the carbamate by heating its solution in presence of ammonia.

"CARBONATE OF AMMONIA" OF COMMERCE.

Form.—The author points out that the variations in the appearance of this substance, whether between one sample and another, or between different layers of the same sample, are not proofs of any material difference in composition. It may be very compact, with a more or less conchoidal fracture, or in softer cakes of prisms arranged uniformly perpendicular to the surface of deposition, or in white nearly opaque layers, and yet differ no more in composition than two samples of similar appearance. On the other hand, similarity in appearance is no proof of identity in composition.

Chemical Composition.—No one has attributed to the commercial carbonate anything like an unvarying composition, but it seems to be universally accepted that this does usually approximate pretty closely to that expressed by the formula—

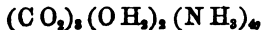


which has in 100 parts—

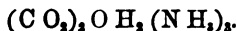
Carbonic anhydride	55.93
Ammonia	28.81
Water	15.26

And it cannot be denied that in the main the published analyses of it indicate that such is its approximate composition.

The author has analysed several samples of the carbonate at present in commerce, and has found that it is very uniform in composition, with one special exception, and that this composition is no longer that represented by the formula—



but that expressed by the simpler formula,

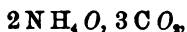


This formula, represented by the symbols of the old atomic weights, becomes more complex than the other formula similarly represented; thus:—

1st formula, old notation . . . $(\text{C O}_2)_3 (\text{O H})_3 (\text{N H}_3)_3$

2nd formula, old notation . . . $(\text{C O}_2)_4 (\text{O H})_3 (\text{N H}_3)_3$

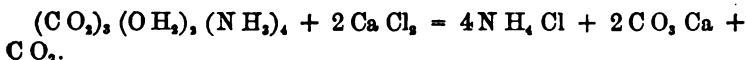
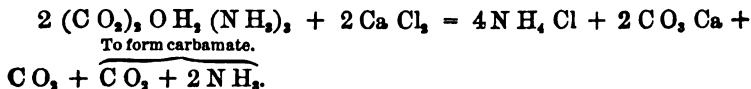
This, the author thinks, had some influence on the selection of the formula; for Ure's analysis, which both here and abroad seems to have been the first which enabled chemists to adopt a formula for the commercial carbonate, agrees much more closely with the second formula than with the first. But then the first could be represented by the formula of an ammonium salt, thus—



while the second could not. However, the results of other analyses corresponded more nearly with the formula adopted, and so strengthened the grounds of its selection.

It is of some interest to adduce proofs, other than analytical, that the carbonate, now in commerce, differs from that most generally in commerce formerly. Firstly, Rose found on distilling the ordinary commercial carbonate at a very gentle heat, that the contents of the retort gradually liquefied. This experiment has been repeated with the utmost care to proceed as slowly as possible, taking, for instance, about 90 hours' continuous and nearly uniform heating to distil about 250 grms., and hardly any liquid obtained at all; yet the products of distillation were less hydrated than those Rose obtained.

Secondly, as already pointed out, by distilling the carbonate at present in commerce with anhydrous calcium chloride, ammonium carbamate condenses. Now this allows of no explanation, unless the carbonate is admitted to have a different composition from what it used to have. The reactions in the two cases are expressed by the following equations;—



Thirdly, as shown by a trial described further on, the commercial carbonate loses by exposure a proportion of its weight corresponding closely with that calculated, as due to carbamate, from the formula deduced from the author's analyses.

Fourthly, its solubility is about twice as great as that of acid

carbonate, of which it contains about half its weight, according to the formula now deduced for it.

Fifthly, its saturated solution does not seem as if it were charged with carbonic anhydride, as does that of the half-acid ammonium carbonate.

Behaviour on Exposure.—Two clean lumps of the compact carbonate, weighing together 25 grms., were exposed for some weeks at a mean temperature of about 10° C., and then weighed. They were found to have lost nearly 11 grms. in weight: they were opaque, but they still preserved their shape and size. They could be lightly handled without soiling the fingers, and squeezed pretty firmly without being crushed. They were found to be fully changed to their centre. Their loss corresponded to 43 or 44 per cent. This nearly agrees with the calculated loss, which is about 42 per cent., if the amount of acid carbonate in the sample be approximately estimated by the quantity of water in it. The calculated loss by exposure of the carbonate in commerce of the formula $(\text{C O}_2)_2, (\text{O H}_2)_2, (\text{N H}_2)_4$ is only 33 per cent. A sample of commercial carbonate lost by 24 hours' exposure, according to Dalton, 50 per cent. of its weight; this makes it probable that it had the composition the author finds the carbonate to have at present, for when free from any water in addition to that in the formula, this is just its calculated loss by exposure. In cold moist weather the commercial carbonate appears to be slightly deliquescent, but in consequence of other changes it is difficult to decide this point conclusively.

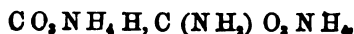
Behaviour with Water.—It dissolves in four parts of water at 15°.

The ordinary method of determining solubilities cannot, it is evident, be employed in this case, because a saturated solution decomposes any fresh carbonate added to it.

Behaviour with Alcohol.—It is well known that rectified spirit dissolves out carbamate from the commercial carbonate, leaving undissolved the acid carbonate.

Chemical Constitution.—The weight of evidence is, the author thinks, decidedly in favour of the commercial carbonate being a single substance,—that is, of the carbonate at present in commerce, not the old carbonate, being so.

Regarded as a single substance, its constitution seems to be simple enough. It is that of a double salt of carbonic and carbamic acids, as is shown by the formula—

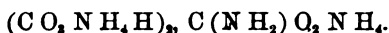


or quite as probably, by double this ; or



Many of its reactions support the notion that it is either a mixture or a compound of carbamate and acid carbonate ; they are too well known to be enumerated. None of its reactions are opposed to this notion. Another argument in favour of this view of its constitution is afforded by the fact just now referred to, that the acid potassium carbonate prevents the dissipation of ammonium carbamate by a heat of 60° , this being in all probability due to its forming a double salt with the carbamate, similar in constitution to the commercial carbonate of ammonia.

The carbonate formerly so general in commerce cannot apparently be represented, assuming it to be a single substance, as of a very intelligible constitution, inasmuch as this must be that of a double salt formed of two atoms of a salt of a dibasic acid and one atom of a salt of a monobasic acid, thus :—



But the grounds which lead the author to consider the carbonate at present in commerce as probably a single substance, cause him to regard the old carbonate as a mixture only of this with acid carbonate.

SUBLIMATION OF THE CARBONATES OF AMMONIA.

When ammonium carbamate is volatilised, it is not converted into a vapour of itself, but into a mixture of carbonic anhydride and ammonia gases. In like manner any carbonate of ammonia by volatilisation is decomposed into a mixture of carbonic anhydride, ammonia, and aqueous vapour.

As these substances do not recombine with each other until their temperature is much below the condensing point of steam, much water separates as such from the mixture ; and the nature of the solid sublimate depends on the reaction of moist carbonic anhydride with ammonia, and the behaviour of the product of this reaction with liquid water. The only effect therefore that variation in the temperature employed for sublimation can produce is to send a variable quantity of water into the mixture of gases undergoing condensation.

The modification produced in the products obtained by slow and rapid distillation is due apparently to the temperature of the condensing tube, to the quantity of water, and particularly to the rate at which the gases are sent along the tube.

RE-SUBLIMATION OF COMMERCIAL CARBONATE OF AMMONIA.

From the results of the author's analysis it appears that in distilling the commercial carbonate very slowly, a thin film of liquid first condenses, which soon becomes a thin layer of crystals, probably of normal carbonate. Next, after a cessation in the volatilisation, during which the temperature rises several degrees, some moist ammonium carbamate deposits. (This is really the first product of the distillation, the normal carbonate being only the product of the action of moisture, —that adhering to the carbonate and to the retort, and that in the air, —on the ammonia and carbonic anhydride into which some of the carbamate of the commercial salt always passes when placed in a fresh volume of air.) After this, slightly moist commercial carbonate $[(\text{CO}_2)_2, \text{O H}_2, (\text{N H}_2)_2]$ is deposited, forming the great bulk of the products. Lastly, a very thin layer of moist and more acid carbonate is formed, either by direct condensation, or else by the action of water and carbonic anhydride on the superficial part of the commercial carbonate already deposited. Even, therefore, when the commercial carbonate is distilled very slowly indeed, the product consists principally of the same substance; by a more rapid distillation the product would no doubt consist almost entirely of it. For firstly, the refined carbonate of commerce has the same composition as that of the commoner kind; secondly, Rose's distillation of the carbonate then in commerce yielded him the carbonate now in commerce; and thirdly, the product of the distillation, not too slow, of either the acid, half-acid, or normal carbonate has the composition of the commercial carbonate. The quantity of free and combined water in the deposit increases from the outer to the inner layer; this is explained by the fact that it corresponds with the increase of the heat applied to the retort, and therefore, to the increase in the rate of the evaporation of the water.

Reactions of Ammonium Carbonate and Carbamate on Calcium Chloride. E. Divers, M.D. (*Journ. Chem. Soc.*, 2nd series, viii., 359.) In a subsequent paper to the preceding, the author describes some experiments on the precipitation of solutions of ammonium carbonate, sodium carbonate, and ammonium carbamate by calcium chloride. From these results it appears that when added *in excess* to ammonia and chloride of calcium, the carbamate precipitates the calcium very slowly, while the carbonate precipitates it immediately. This reaction serves to distinguish the carbamate from the carbonate.

When either ammonium carbonate or sodium carbonate is mixed with an excess of calcium chloride and ammonia, only an imperfect

precipitation of calcium carbonate is effected. On the contrary, when the alkaline carbonate is in excess, the precipitation is immediate and complete.

It results therefore that caustic ammonia in the presence of excess of calcium chloride very considerably retards the precipitation of calcium carbonate.

When a solution of carbonic anhydride is treated with excess of calcium chloride and ammonia, it first forms carbamate which slowly passes into carbonate; but its imperfect precipitation as carbamate is essentially due to the fact that the excess of calcium chloride and ammonia greatly retards the complete precipitation of calcium carbonate in the cold.

A Simple and Rapid Process for the Estimation of Ammoniacal Salts. M. Rabuteau. (*Journ. de Pharm.*, 4th series, xii., 274.) It is known that an alkaline solution of hypochlorite of soda reacts upon ammoniacal salts, decomposing them, and liberating nitrogen. The author has founded upon this reaction a process for the estimation of ammonia. He prepares the hypochlorite solution by decomposing chloride of lime with carbonate of soda. So made, the liquor contains hypochlorite, carbonate, and caustic soda. 100 grammes of good chloride of lime, dissolved in water, and mixed with a solution of 200 grammes of carbonate of soda, should furnish two litres of the liquor. 20 to 40 c.c. of the fluid containing the ammoniacal salt sufficiently diluted, are introduced into a small flask of 200 c.c. capacity, which is then filled up with the hypochlorite solution, and heat applied; the evolved nitrogen is collected in a graduated tube. The only precaution necessary is to have the ammoniacal salt present in sufficiently small quantity for the decomposition to be complete. The author states that, by making the necessary corrections for aqueous vapour, pressure and temperature, after reading the volume of gas, very exact determinations of ammonia may be obtained with this process. He has applied it more especially to the recognition of small quantities of ammonia in the animal organism.*

Oxy-Ammonia. M. E. Frémy. (*Journ. de Pharm.*, 4th series, xii., 5.) On a previous occasion, the author described the production of a body, possessing powerful reducing properties, which is formed when nitrous acid or nitrites are submitted to the action of hydrogen, sulphuretted hydrogen, sulphurous acid, the alkali metals, zinc, tin, etc. Owing to the small quantity obtained, the author was unable at that time to determine the exact nature of

* It should be remembered that urea and some other organic nitrogenous compounds, are also decomposed by hypochlorite of soda, furnishing nitrogen gas.—Ed.

this body. He has recently, however, discovered a much readier method for its preparation, and has been consequently enabled to examine more fully its characters and nature. The following is the process he adopts :—

Tin is treated with strong hydrochloric acid, chemical action being induced by a slight elevation of temperature; when hydrogen is generating abundantly, nitrous acid, or a nitrite, or more simply nitric acid, is added to the liquor. The oxide of tin is afterwards precipitated by ammonia, and the filtrate evaporated to dryness by a water-bath or in vacuo; the dry residue is then heated several times with absolute alcohol, which dissolves the hydrochlorate of the new base.

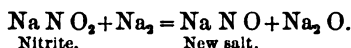
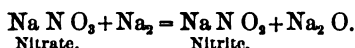
The circumstances under which this body is formed, led the author to regard it as possibly identical with oxy-ammonia, discovered by M. Lossen. The formula for oxy-ammonia is NH_2O , and it may be regarded as nitrous acid, HNO_2 , in which one atom of oxygen is replaced by two atoms of hydrogen. Its production by the reducing action of hydrogen on nitrous acid is thus perfectly intelligible. The basic substance obtained by the author, possessed powerful reducing properties, especially when set free by an alkali, and the liquor so formed reduced salts of copper, mercury, silver, and gold. M. Lossen makes no mention of this property in his description of oxy-ammonia, but the author has prepared the latter body strictly according to M. Lossen's process, and finds its properties to be identical with his own base.

The Existence and Formation of Salts of Nitrous Oxide. E. Divers, M.D. (*Proc. Royal Soc.*, xix., 425.) Metallic sodium thrown on a solution of an alkaline nitrate, was found by Schonbein to reduce it to nitrite. By using the sodium in the form of amalgam, the complete reduction of the nitrate to nitrite can be readily effected, and silver nitrite freely precipitated from the solution by first neutralising it with an acid, and then adding silver nitrate.

But so soon as nitrite is thus formed by the sodium, it itself begins to suffer reduction, as well as the remaining nitrate, by the action of more sodium. This reduction of the nitrite is rendered evident by the effervescence which attends it, the gas given off consisting of pure nitrous oxide. If excess of sodium amalgam be gradually added to the nitrate solution, and its action moderated by keeping the vessel containing the mixture in a stream of cold water, the effervescence only becomes very lively when the sodium added has nearly reached the proportion of two atoms to one of the nitrate used. When four atoms of sodium have been oxydised by the solu-

tion, the further addition of it is without effect; no more effervescence takes place, and the sodium remains unchanged in the mercury.

The very alkaline liquid which is left by the reaction contains a new salt, though in relatively small quantity, the salt of nitrous oxide, Na N O . The reaction occurring may be thus expressed:—



After neutralising the alkaline liquid by acetic acid, it gives a yellow pulverulent precipitate with silver nitrate. This precipitate, when thoroughly washed, may be dried at a gentle heat. It has the composition Ag N O . The original solution containing the sodium salt, when acidified with acetic acid and heated, evolves nitrous oxide gas. The author gives full details of the various reactions of this interesting compound.

A New Source of Sulphur. (*Pharm Journ.*, 3rd series i., 347.)

A new source of supply of sulphur is announced in the *New York Times*. It is the island of Saba, one of the Dutch West Indies, situated about 110 miles south-east from St. Thomas, and 40 miles south-west from St. Martha. The island is of volcanic origin, about 11 miles in circumference, and at its highest point about 2800 feet above the sea-level. Though a Dutch possession, the language spoken by its 2000 inhabitants is chiefly English. The sulphur deposit was discovered by a person from New York, who, noticing indications of sulphur-ore, quarried, with the help of the natives, two sloop loads, which he took to New York, and submitted for analysis. The report of the chemists was to the effect, that while the Sicily ores yield only about 30 per cent. of brimstone for the ore consumed, the Saba ore yields an average of over 60 per cent. Adding to this the fact that the island is only about 1500 miles from New York, it will be seen that this is an important discovery, and it will not be wondered at that steps have been taken to secure leases of the best tracts on the island.

The Sulphur Beds of California. (*Pharm. Journ.*, 3rd series, i., 6.)

Sulphur has been chiefly supplied from the sides of Mount Etna, in Sicily, but the works on the shore of Clear Lake produce now four tons a day. The Sicilian brimstone costs in California 4 cents per lb., but the domestic article is sold for $3\frac{1}{2}$ cents. Clear Lake occupies the crater of an extinct volcano, and the

evidences of volcanic action abound in the vicinity. Within a triangle of about twenty-five miles to the side there are volcanic scoria, trap, lava, obsidian, tufa, warm springs, and other remains of eruptions, with signs of subterranean heat not far from the surface. The sulphur bed of Clear Lake consists of a bank resembling ashes, containing numerous alkaline and sulphur springs with vent-holes, from which sulphurous fumes escape. Pure sulphur crystals deposited from the fumes surround these holes. The earth, containing about 50 per cent. of sulphur, is placed in an iron retort heated to a high temperature, so that the sulphur is driven off in fumes into a receiver, where it settles in a liquid form, and runs out into pine boxes, 2 feet long and 1 foot square. The lump sulphur is used chiefly for making powder and sulphuric acid, which last is employed in making bluestone, giant-powder, nitric acid, and muriatic acid, and in refining gold and silver. The consumption of sulphuric acid, nitric and muriatic acids on the coasts amounts to 2,000,000 lbs., and the entire demand is supplied by home manufacture. Flowers of sulphur have also been produced at Clear Lake. The fumes passing off from the retort are, in this case, led into a large cool chamber, where they condense into a flaky snow-like condition.

Sulphurous Acid as a Disinfectant. Sulphurous acid gas is liberated by burning sulphur. It is a powerful destroyer of the germs of contagion, but owing to its deleterious and suffocating odour it cannot be introduced in any quantity to the room of a sick person; nevertheless, it is very useful, as an agent of disinfection.

Mr. Startin, the senior surgeon to the Hospital for Diseases of the Skin, Blackfriars, in a communication to the *British Medical Journal* (1871, i., 60), recommends the following method of fumigation to be used for the purpose of preventing the spread of contagious diseases. For disinfecting beds and bedding, a warming-pan or some other suitable utensil, containing a few live embers, upon which a teaspoonful or two of flowers of sulphur has been thrown, should be passed to and fro between the sheets until the combustion of the sulphur is complete. After a few minutes the patient may enter the bed. Should the fumes prove too stimulating for his respiratory organs, they may be intercepted by holding a loosely folded damp handkerchief before the mouth until they have subsided. To disinfect clothing it should be lightly sponged or sprinkled with water containing well-mingled milk of sulphur, in the proportion of a teaspoonful to a pint of water, and then ironed with a flat iron,

at a temperature sufficient to volatilize the sulphur without the clothing. This process should be repeated according to its extent and duration of the infection.

Dr. Fergus, writing to the same journal (1871, i., 90), says he has found the readiest method of developing sulphurous acid gas by igniting two parts of flowers of sulphur and one of charcoal on any incombustible surface, such as a saucer of tin. He says also that sulphurous acid is not so much objectionable as it has the appearance of being. An atmosphere charged with it may be breathed with very small inconvenience, which soon passes off. Dr. Fergus has used it with success in cases of the affection known as "hay-fever."

During the recent epidemic of small-pox in London, sulphurous acid gas has been largely used by the local authorities for disinfecting rooms in which patients have been nursed. The room is closed so much sulphur burnt within it as to render the air of the room quite irrespirable. But as it is difficult to light and maintain the ignition of a large quantity of sulphur, bisulphide of carbon has been chiefly employed for the generation of the gas. Sulphur dioxide, as is well known, burns readily, producing sulphurous acid gas by its combustion. About a pint of this gas is placed in a metallic vessel within the room, and lighted through the door.

Solution of sulphurous acid gas in alcohol has also been recently recommended as a convenient agent for disinfection. This gas is much more soluble in alcohol than it is in water. The alcoholic solution thus obtained contains in solution 100 times its volume of sulphurous acid.

Composition of the Hyposulphites. E. A. Letts. (*Journ. Chem. Soc.*, 2nd series, viii., 424.) Though the salts of hyposulphurous acid have been comparatively well studied, some difference of opinion exists as to their chemical constitution. Rose states that anhydrous water is retained by all the hyposulphites, which is due to their composition, and can only be expelled when the salts themselves are decomposed.* Pape, Kessler, and some others, on the contrary, have maintained that most, if not all, the hyposulphites can be obtained in the anhydrous condition. In the present paper, which was read at a meeting of the Chemical Society, the author describes in detail a careful set of experiments

the results of which statement has been generally accepted by chemists, and is to be found in the *Annals of Chemistry*.

undertaken for the purpose of deciding this question. He states the result as follows :—

By the experiments above described, I am led to the conclusion that hydrogen is *not* a necessary constituent of the hyposulphites. Commencing with the sodium salt, we find that it crystallises with six molecules of water, and that the whole of these are given off at 100° C., or in vacuo over sulphuric acid. Pape asserts that a temperature of 215° C. is necessary to expel the last molecule of water from this salt. The barium salt crystallising with only one molecule of water, can be obtained anhydrous in the same manner. The lead salt crystallises free from water; its formula (as it crystallises) being PbS_2O_3 . The strontium salt is somewhat more complex in the arrangement of its molecule.

From its analysis it would seem to crystallise with five equivalents of water. Of these four may be expelled at 100° C., and at a higher temperature (200° C.) half a molecule more is given off, but the remaining half must be constitutional, as immediately above this temperature the salt decomposes. It is therefore probable that the molecule of this salt should be formulated thus:— $2(\text{SrS}_2\text{O}_3)$, $10\text{H}_2\text{O}$, nine molecules only of water being expelled without decomposition of the salt. Kessler asserts that strontium hyposulphite crystallises with six equivalents of water (instead of the five found by these experiments), and that it retains one at 180° C. The magnesium salt loses at 100° C., only three out of the six molecules of water which it contains; the other three do not appear to be expelled till decomposition of the salt has commenced. The cobalts and nickel salts decompose so readily, that they are not well suited for experiments in this direction.

On the Solubility of Bisulphide of Carbon in Alcohol. By Tuchsmidt and Follenius. (*Deutsch. Chem. Gesell. Ber.*, iv. 583.) It is known that carbon bisulphide mixes with alcohol in all proportions, only if the latter is free from water. In the presence of water there appears soon a point where the increased addition of bisulphide produces turbidity. The authors have attempted to utilise this circumstance for the estimation of the water contained in alcohol, and they prepared tables indicating the volumes in c.c. of bisulphide dissolving clearly in 10 c.c. of alcohols of various densities at certain temperatures. If now the amount of water in a spirit is to be determined, 10 c.c. of it are taken, and bisulphide of carbon is permitted to drop into it from a graduated tube, the first drop beyond the quantity capable of dissolving produces instantaneous turbidity. The following table

is composed for 17° C., the mean annual temperature of dwelling houses.

ture.	Spirits of wine employed, in c.c.	Percentages of alcohol in it according to weight.	Bisulphide of carbon (dissolved), in c.c.
1.	10 c.c.	98.50	18.20
		98.15	19.20
		96.95	10.00
		93.54	7.00
		91.37	5.00
		84.12	3.00
		76.02	2.00
		"	"
		"	"
		"	"
		48.40	0.20
		47.90	0.00

alcohol mixes in all proportions with carbon bisulphide, and is considered as absolute.

Phosphorus. Blondlot. (*Journ. de Pharm.*, xii., 447.) Phosphorus was originally discovered by Thénard, who obtained it by distilling ordinary phosphorus a great number of times. On suddenly cooling the melted product, it became black; in the fluid condition it was yellowish white, and resembled ordinary phosphorus in all other respects. Subsequent attempts to modify it were made by other chemists to obtain this peculiar modification, but in 1866 M. Blondlot placed before the French Academy a specimen of black phosphorus, which he had obtained by Thénard's process, excepting that fewer distillations were made, and the product of each was exposed to the action of the sun's light. Like ordinary phosphorus, the author naturally thought that all phosphorus brought to a higher degree of purity could undergo the modification in question. Some time after, however, having exhausted the stock of phosphorus which had served for his first researches, he tried to obtain the same result with a fresh supply. From this he concluded that the true cause of the phenomenon must be sought not in the purity, but in the mode of simple distillation. After many trials, a fortunate circumstance put the author on the track. On distilling some phosphorus which, from having been in contact with metallic mercury, had retained some almost imperceptible globules, black phosphorus was obtained, similar in all respects to that of Thénard. The experiment having been repeated several times, either with small quantities of metallic mercury, or some mercurial

preparation; the author sought to ascertain whether it would suffice simply to heat the phosphorus under water with a little mercury.

He found that after five or six hours heating, according to the proportion of the metal present, the phosphorus became suddenly black, at the moment of solidification, losing its colour again on fusion, and so on alternately.

An extremely small proportion of mercury suffices to colour the phosphorus; one centigramme being sufficient for 50 grammes of phosphorus. The metal remained not sensibly diminished after the action was completed. By carefully agitating the phosphorus melted beneath water in the presence of mercury, and excluding contact with the air, a peculiar froth rises like a scum to the surface, but no gas escapes.

By whatever method it has been obtained, black phosphorus presents characters which are always identical. The colour is not uniform, but is distributed in a number of spots more or less regularly through the mass. Occasionally the colour accumulates in certain parts, leaving others white. Sometimes the phosphorus is blackest when cooled suddenly, while on the contrary, it is some times necessary to cool it slowly. It is easy to separate the colouring matter by treating the phosphorus with sulphide of carbon. The black matter remains insoluble, and may be removed by filtration. By distilling the solution in a current of hydrogen, and receiving the product in a flask of boiling water, the sulphide of carbon may be separated, and the phosphorus recovered. It has returned to its normal condition, and can only be reblackened by again heating it with mercury. The quantity of black powder remaining on the filter is always extremely small; 100 grammes will not furnish more than one or two centigrammes. The author tested this pigment for mercury by heating it in a tube with concentrated acetic acid which dissolved it with difficulty; the solution was evaporated and placed upon a sheet of clean copper with a drop of hydrochloric acid, when if mercury was present a white spot was obtained. He found that the pigment from black phosphorus obtained by a single heating or distillation with mercury always contained this metal. On the contrary black phosphorus which had been distilled four or five times, mercury only being employed in the first distillation, contained not the smallest trace of the metal. It was the same with the black phosphorus which had been formerly obtained through repeated distillations. From this he infers, that although quicksilver contributes to the formation

of pigment, it is not an essential part of it, and may be entirely separated. The pigment in question appears to be more volatile than normal phosphorus. By fractionizing the distillation, the first portions which pass over are the most susceptible to become black on cooling, while the last almost invariably remain white.

Amount of Arsenic in Phosphorus of Commerce. C. J. Rademaker, M.D. (*Amer. Journ. Pharm.*, xlii., 507.) In preparing dilute phosphoric acid according to the process of U. S. P., the author passes a current of sulphydric acid through the solution, in order to free it from all substances precipitable by that agent in acid solutions, invariably obtaining a yellowish precipitate, which upon examination proves to be sulphide of arsenic.

In order to find the amount of arsenic present in a given quantity of phosphorus, he has resorted to the following process:—

100 grammes of phosphorus were oxidized with nitric acid, the solution diluted; and the arsenic precipitated as a sulphide (As_2S_3) by means of sulphydric acid, the solution allowed to rest for six days. The precipitated sulphide of arsenic was collected on a filter and washed, transferred to a small evaporating dish, and oxidized with nitric acid, and reduced by means of sulphurous acid to arsenious acid, and precipitated in the form of As_2S_3 by means of sulphydric acid; the precipitate digested with ammonia, in order to free it from the small amount of sulphur present, the solution filtered from the undissolved matter, and evaporated, dried, and weighed, and found to weigh 15 grains, or nearly one gramme.

Simple Method for Purifying Metallic Arsenic. (*Chem. News*, xii., 167.) In order to restore to this metal its bright aspect, and also for the removal of any slight coat of suboxide which may adhere to it, the author advises that the metallic arsenic should be boiled for a few minutes in a moderately strong solution of bichromate of potassa, slightly acidified with sulphuric acid. The metal is next washed with water, and then with alcohol or ether, and lastly placed in a small tube, closed at one end, and sealed immediately after the arsenic has been put into it. Phosphorus, which has been kept a long time under water, and has become thereby coated with a whitish yellow crust, may be treated in the same way, when it becomes quite colourless again. The phosphorus should be, of course, carefully heated, so as to prevent its ignition; and, after having been well washed with cold water, should be preserved in water freed from air by having been previously boiled for a long time, and cooled in a well-closed vessel.

On the Specific Gravity of Aqueous Hydrobromic Acid
C. R. A. Wright. (*Chem. News*, xxiii., 242.) The author
the following table:—

Per centage of H. Bromide.	Sp. gr. at 15° C.	Difference for 5 per cent.	Difference in 1 pe cent.
Nil.	1·000	—	—
5	1·038	0·038	0·0076
10	1·077	0·039	0·0078
15	1·117	0·040	0·0080
20	1·159	0·042	0·0084
25	1·204	0·045	0·0090
30	1·252	0·048	0·0096
35	1·305	0·053	0·0106
40	1·365	0·060	0·0120
45	1·435	0·070	0·0140
50	1·515	0·080	0·0160

Preparation of Hydrobromic Acid. Champion and P
(*Journ. de Pharm.*, 4th series, xii., 260.) The process recommen
the authors for preparing this acid is to transmit the vapour of b
through fused paraffin. They employ two tubulated retort
first, containing bromine, is heated to about 65° C., and the s
containing paraffin, is maintained at 185°. A glass tube c
the vapour of the bromine beneath the surface of the paraff
U tube filled with fragments of moistened glass and phos
transforms into hydrobromic acid the last traces of bromine
may escape the reaction. The gaseous hydrobromic acid w
disengaged is absorbed by water. The action which occur
follows:—A portion of the bromine replaces hydrogen in the p
while another passes off with the hydrogen as hydrobromi
After a certain time, depending on the weight of the paraff
ployed, it is useless to continue the transmission of bromine
brominated compound formed is decomposed at about 180°
engaging the greater part of the combined bromine as hydro
acid. After completing the action of the bromine on the p
and the action of the heat on the brominated compound, a c
aceous residue is obtained which, washed by boiling ether, a
and sulphide of carbon, contains still bromine and hydrogen
composition of this residue is as follows:—

Carbon	63·0
Hydrogen	5·3
Bromine	31·6
	<hr/>
	99·9

The solution of hydrobromic acid thus obtained, saturated at zero, has a density of 1.78. It corresponds to the formula $\text{HBr} \cdot \text{H}_2\text{O}$, one cubic centimetre containing 1.46 gramme of hydrobromic acid. When heated, it loses some gas, and gives a hydrate which distils regularly at 126°C ., has a density of 1.48, and corresponds to $\text{HBr} \cdot 5 \text{H}_2\text{O}$. The paraffin employed by the authors fused at 55°C .

The Preparation of Bromide of Sodium. Castelholz. (*Journ. de Pharm. Méd.*, vi., 337. 1870.) The author proposes to substitute bromide of sodium for the potassium salt in medical practice. The process which he recommends for the preparation of bromide of sodium is to transform bromine into bromide of ammonium, to separate this by crystallisation from the more soluble iodide of ammonium, and then to decompose it by an equivalent quantity of pure carbonate or caustic soda. This process gives the bromide at once free from bromate. It has the advantage over similar methods, in which the bromides of zinc or iron are decomposed by carbonate of soda, that there is no precipitate to wash, which, in operations on the large scale, is apt to entail a certain loss. The preparation of bromide of ammonium, by allowing bromine to fall drop by drop into pure dilute ammonia, gives rise to a lively action, with disengagement of heat, and liberation of nitrogen; but the evolved gas is apt to carry off with it either ammonia, bromide of ammonium, or bromine, thereby causing loss. By operating in a stoneware Woulf's apparatus in such a manner as to condense the evolved vapours, this loss is avoided. The evaporation of the liquor is effected in a cast-iron retort, the vapours being condensed in stoneware. The crystals which form in the concentrated liquor are drained, washed with a saturated solution of bromide of ammonium containing an excess of bromine, again drained, and dried in a centrifugal machine. By recrystallisation the salt is obtained in a state of chemical purity.

To prepare bromide of sodium it is only necessary to decompose the bromide of ammonium with solution of caustic soda or carbonate of soda. By operating in a distillatory apparatus, the free ammonia or carbonate of ammonia is collected in the distillate, and can be used again in the manufacture of fresh bromide of ammonium. The solution of bromide of sodium left in the retort is evaporated and crystallised.

It is important that the soda used in this process should be as pure as possible, and on this account the carbonate of soda obtained by calcining the bicarbonate is to be preferred.

The solution of pure bromide of sodium evaporated and put to

crystallise, deposits crystals which, according to the temperature at which they are formed, are either anhydrous or hydrated.

If the temperature is above 20° Centigrade, the bromide of sodium crystallises in white anhydrous cubes of the formula Na Br .

If the temperature is below 20° C., or, according to M. Balard, below 30° C., the salt forms colourless and transparent hexagonal tables, containing two molecules of water: $\text{Na Br} \cdot 2 \text{H}_2\text{O}$. These crystals, when heated, melt in their water of crystallisation; when dried, the salt undergoes igneous fusion without decomposition. To obtain a product always identical, the best plan is to evaporate the solution of bromide of sodium in a silver basin, and remove the salt which deposits as the evaporation proceeds. In this way a crystalline powder is obtained, consisting of small anhydrous cubes.

When bromide of sodium is ordered in a prescription, it might become a question whether the anhydrous or the hydrated salt should be used; the author states that the accepted rule is always to employ the anhydrous crystals. The following table is given to facilitate the comparison of the doses of the bromide of sodium with that of the better known potassium salt:—

Bromide of Potassium.		Bromide of Sodium.		Bromine.
5	=	4.33	=	3.33
10	=	8.66	=	6.66
15	=	13.00	=	10.00
20	=	17.33	=	13.33
25	=	21.66	=	16.66
30	=	26.00	=	20.00

The taste of bromide of sodium is identical with that of chloride of sodium.

Tetrabromide of Carbon. Bolas and Groves. (*Journ. Chem. Soc.*, vol. viii., p. 161.) Some of the combinations of bromine and carbon have been already investigated, but the tetrabromide has remained unknown until its formation by the authors of the present paper. Pure bromine exerts no action on bisulphide of carbon, even at high temperatures; but in the presence of iodine bromide, antimony tribromide, a reaction occurs by which tetrabromide of carbon is formed. The authors heat together 2 parts of bisulphide of carbon, 14 parts of dry bromine, and 3 parts of iodine, in a closed tube, to 150° C. for 48 hours. On afterwards distilling the contents of the tube with excess of caustic soda solution, the tetrabromide distils over with water. It is collected, freed as far as possible from moisture, and crystallised from spirit. Bromopicroin or bromoform

also yields this substance when treated with bromide of antimony, or bromide of iodine and free bromine.

Tetrabromide of carbon is a white substance crystallising in translucent plates, and melting at 91° C. It has an ethereal odour somewhat resembling that of tetrachloride of carbon, and a sweetish taste. It is almost insoluble in water, to which however it communicates its odour and taste. It is exceedingly soluble in ether, sulphide of carbon, chloroform, and benzol. It is also very soluble in hot alcohol, from which it crystallises on cooling.

Report of Experiments on the Bromide of Potassium used in Medicine. (*Brit. Med. Journ.*, 1870, ii., 176.) The bromide of potassium now used in medicine is remarkably pure. Out of six samples described below, only one contained iodine; and even in that case the amount of iodine was very minute. The crystals of bromide of potassium, like those of the iodide, are sometimes transparent and sometimes opaque; the latter kind containing a certain amount of water, while the former are almost, if not entirely, anhydrous.

Analyses of these six samples gave the following results.

No.	Obtained from	Quantity taken. (grains.)	Silver-salt obtained.	Silver required.
1.	Eye Hospital, Moorfields; transparent kind.	5.955	9.32	5.40
2.	London Hospital; ditto	5.955	9.32	5.40
3.	Douthwaite, 58, Bishopsgate; ditto	5.355	9.22	5.40
4.	Skin Hospital; ditto	5.955	9.40	5.40
5.	Warner & Co., Fore Street; ditto	5.955	9.26	5.40
6.	Bell & Co., Oxford Street; opaque kind	5.955	9.05	5.26
	The theoretical numbers for absolutely pure bromide of potassium are	5.955	9.40	5.40

A determination of water was made in the sample of opaque bromide (No. 6). It contained 2.7 per cent. of water.

The sample No. 3, from Douthwaite's, contained a trace of iodide of potassium; all the rest were quite free from iodine.

These results show that chlorides are almost entirely absent from the commercial bromide of potassium in some instances; and that the worst of the samples examined, there was not more than 5.2 per cent. of chloride of potassium.

The method of examination adopted in this case was the same as that described in the report on iodide of potassium.

Report of Experiments on the Iodide of Potassium used in Medicine. (*Brit. Med. Journ.*, 1870, ii., 96.) With the object of as-

certaining the degree of purity which may be looked for in the iodide of potassium as supplied by the druggist to the medical man. Six samples of the drug were procured, and submitted to chemical analysis. These samples were obtained from hospitals and from druggists in various parts of London.

The chemical examination was made as follows:—8·305 grains of the iodide, in the undried state and not previously powdered, was dissolved in a little water, and to it a very little alkaline chromate of potash was added, and a standard solution of silver was then dropped into the liquid until the red tinge (the sign that the iodide of potassium was completely saturated with nitrate of silver) marked its appearance. The quantity of standard solution of silver being noted, the quantity of silver was of course known. As will be seen from the tabular statement, the quantity of silver used up was that indicated by theory in the first five cases, while in the last only was a little in excess of the quantity required for absolutely pure iodide of potassium.

After noting the quantity of silver solution, the resulting iodide of silver was washed first with very dilute nitric acid, then with pure water, and finally dried and weighed. The following is a tabular statement of the results thus obtained; viz.:—

No.	Obtained from	Quantity of iodide of potassium taken. (grains.)	Quantity of iodide of silver. (grains.)	Quantity of silver employed. (grains.)
1.	Moorfields Eye Hospital	8·305	11·49	5·40
2.	London Hospital	8·305	11·68	5·40
3.	Skin Hospital	8·305	11·66	5·40
4.	Leo Lee & Co., Bishopsgate St. .	8·305	11·66	5·40
5.	Hancock, Fleet Street	8·305	11·48	5·40
6.	Warner & Co., Fore Street . . .	8·305	11·68	5·51
	Theoretically pure iodide of potassium	8·305	11·75	5·40

From these results it appears, firstly, that the iodide of potassium is remarkably free from bromide and chloride; and secondly, that as actually sold, it is very dry. According to these analyses, 100 parts of commercial iodide of potassium, contain from 99·3 to 99·9 parts of absolute iodide of potassium, the remainder being the evitable "hydrometric moisture." It is most satisfactory to find this drug to be commonly supplied in so high a state of purity.

There are two varieties of iodide of potassium—the *opaque* crystals and the *transparent*. Fashion has led to the opaque kind being

red; but there is no other reason in favour of the opaque. The transparent crystals are just as pure.

Iodide of Calcium, and Syrup of Iodide of Calcium. Ottmar Verbach. (*Pharm. Journ.*, i., 364., from *Michigan University Medical Journal*.) Having had occasion to use the chemical specialties called iodide of lime and syrup of iodide of lime, and finding at the articles sold under these very unchemical names were not simple chemical combinations (as for example, iodide of iron or syrup of iodide of iron), but mixtures, the former a mechanical mixture of iodine and quicklime, the latter of the two distinct chemical combinations called iodide of calcium and iodate of calcium, and being desirous to obtain a preparation in strict accordance with the title,—the author investigated the matter, with the following results:—

The preparation called iodide of lime is a mechanical mixture of lime and quicklime which, when put into hot water, undergoes a chemical reaction, forming iodide of calcium and iodate of calcium, illustrated by the following equation:—



These combinations are both contained in the so-called syrup of iodide of lime. To prepare the iodide of calcium free from the iodate of calcium, the most practical method is as follows:—prepare first a solution of the protoiodide of iron, by mixing iodine with small excess of iron and sufficient water; let this stand until the solution assumes a pale green colour; filter, and add to the filtrate as much iodine as has been used to make the solution of protoiodide of iron; heat to the boiling point, and add sufficient lime to precipitate all of the iron, which precipitates in the form of Wöhler's granular magnetic oxide of iron, according to the following equation:—



To obtain the iodide of calcium, filter the solution, and evaporate the filtrate with the exclusion of air, as carbonic acid has the tendency to decompose it. It crystallises in the form of needles; evaporating to dryness it forms a white fusible mass. It is soluble in alcohol, very deliquescent, and decomposes when fused in contact with air, forming oxide of calcium and free iodine. To make a syrup of iodide of calcium, the following formula is proposed. Take of—

Iodine	4 oz.
Iron (in form of wire)	7½ dr.
Distilled Water	q. s.
Milk of Lime (fresh)	q. s.
Sugar	28 oz.
Simple Syrup	q. s.

Mix 3 oz. of the iodine with the iron and 4 oz. of water, in a flask with long neck; shake occasionally until the reaction ceased and the solution assumes a pale green colour; filter the solution and add the remainder of iodine; heat to the boiling point; add milk of lime until all the iron is precipitated; filter and wash the precipitate with hot water until all the iodide is washed off then bring the whole to the measure of 20 oz.; add the sugar, and dissolve by a gentle heat; to the solution add enough simple syrup to make it measure 40 oz.; mix thoroughly, and fill into 2-oz. bottles well corked.

The syrup is a transparent, colourless liquid, which does not turn starch paper blue. Mixed with sulphuric acid it gives a white precipitate of sulphate of calcium, and turns the supernatant liquid brown, which, by heating, emits violet vapours of iodine.

Pure Caustic Soda. (*Pharm. Journ.*, 3rd series, i., 65.) For some time past pure caustic soda, prepared from metallic sodium has been an article of manufacture. The method by which the metal is made to yield caustic soda is as follows:—A deep silver vessel, of a hemispherical form, and capable of holding about five gallons of water, is employed. Into this vessel, which is cooled externally with a current of cold water, is placed a very little water and upon the water is placed a cube of metallic sodium of about half an inch in diameter. The vessel is made to revolve so continually to bring fresh portions of liquid into contact with the metal, and by this means explosion is avoided. When the first cube of metal has dissolved, and yielded a thick syrupy liquid, a little more water and a second cube of metal are added, and the reaction allowed to take place as before, the vessel being kept in motion the time. In this manner several pounds of sodium may be worked up into soda. The thick syrup so resulting is next evaporated down, heated to redness, fused, and poured into a mould.

Inasmuch as the price of sodium is five shillings a pound, the yield of soda from a pound of the metal being about one pound and three quarters, it is plain that the alkali so prepared must be cheap. The danger of explosions (which, however, do not occur when proper care is taken) necessitates the employment of skilled labour in the

manufacture, and constitutes a very serious drawback to the commercial success of the process.

Crystallised Hydrate of Soda. (*Pharm. Journ.*, 3rd series, i., 58.)

According to a communication made by O. Hermes to the Chemical Society of Berlin, crystals containing 30.09 per cent. of anhydrous soda (Na_2O), and having the formula $2\text{NaH}\cdot\text{O} + 7\text{H}_2\text{O}$, are deposited when a concentrated aqueous solution of caustic soda, sp. gr. 1.365, is exposed to the action of intense cold. The crystals form rhombic prisms, and are perfectly transparent and colourless; they begin to melt at 6°C . A point worthy of being remembered is, that impure solutions of soda, contaminated with chloride, sulphate, and carbonate, are capable of depositing these crystals in a state of tolerable purity.

The occurrence of errors respecting the composition of these hydrated crystals in some of the newest treatises on chemistry induced the author to bring the subject before the Chemical Society of Berlin.

Adulteration of Carbonate of Soda. (*Journ. de Pharm. d'Anvers*, 1870, p. 309.) The *Antwerp Journal of Pharmacy* calls attention to the practice of adulterating carbonate of soda by mixing with it a proportion of sulphate of soda. At first sight the admixture is not apparent, though the two salts differ essentially from each other, both in their crystallisation and the chemical properties. The fraud is one that may be easily detected by a chemist.

On a new Reagent for Alkalies. M. Boettger. (*Journ. de Pharm.*, 4th series, xii., 214.) The fresh leaves of *Coleus Verschoffelli*, an ornamental plant, are put in a glass bottle and covered with absolute alcohol, containing some drops of sulphuric acid, and macerated twenty-four hours, when the fluid is decanted and other leaves introduced into the same vessel after the exhausted leaves are removed, the liquid being retained. The tincture thus obtained is charged with the colouring matter of the leaves; it is filtered and strips of paper are introduced, which are then dried in the air.

The best paper thus obtained has a magnificent red colour, which passes more or less to a fine shade of green, by the action of alkalies and alkaline earths. The author considers it better than reddened litmus because more sensitive; it is not modified by carbonic acid, but should be kept close.

Crab Orchard Salt. J. T. Viley. (*Amer. Journ. Pharm.*, xliii., 208.) This salt is obtained from the mineral waters near Crab Orchard, a small town in Lincoln County, Kentucky, from which place it derives its name. It is now used in preference to Epsom

Salt, in all parts of Kentucky, and most of the adjoining States. Nine gallons of water yield a pound of the salt. About six thousand pounds of the salt were produced in 1869. It is said to be counterfeited to a considerable extent in Louisville and Cincinnati.

The following is the result of an elaborate analysis of this salt by the author:—

Sulphate of magnesia	44.778
Sulphate of lime	1.277
Sulphate of potassa	1.871
Sulphate of soda	6.483
Chloride of lithium	0.049
Chloride of sodium	0.412
Water	44.655
Insoluble matter and ferric oxide	0.520

Crab Orchard salt is a brownish white granular powder, without smell, of a saline and at first rather pleasant taste, with an after bitter. The cathartic effect of Crab Orchard salt is similar to that of Epsom salt, except, probably, milder in its action. It is also claimed, by its advocates, to have a specific action on the liver, and good tonic properties. These, together with the fact that smaller doses are required, give it, in the opinion of those who have used it, a decided advantage over the Epsom salt.

The dose is from half an ounce to an ounce dissolved in water; it acts with greater certainty and more advantageously when given in drachm doses, at short intervals, till half an ounce is taken.

On the Occurrence of Sulphate of Ammon-Magnesia in the Lagunes of Tuscany. By Dr. O. Popp. (*Ann. Chem. Pharm.*, 1870.) The author found in all the fumaroles, but chiefly in those of Sasso and Aquaviva, besides the sulphate of ammonia, a double sulphate of ammonia and magnesia. This double salt appears to be a constant associate of the boracic acid, though their relative quantities are in an inverse proportion to one another. Lagunes rich in boracic acid, like that of Larderello, which possesses from 72 to 75 per cent. of boracic acid, have only small quantities of the mentioned sulphates; whilst others, like those of Sasso and Aquaviva, containing much less of the acid, are richer in the sulphate. This double salt separates either pure, or mixed with sulphates of calcium and aluminium, during the concentration of the liquids of the lagunes. By repeated recrystallisation it can be obtained in fine crystals belonging to the monoclinic system. Analysis shows the following composition:— $(\text{NH}_4)_2\text{SO}_4 \cdot \text{MgSO}_4$.

3 H₂O. Often the combination includes also iron, manganese, and lime, which of course replace equivalent quantities of magnesia.

On the Influence of Sugar on Magnesia used as an Antidote. (*Repertoire de Pharm.*, Aug., 1870.) In 1846, M. Bussy, and afterwards Christison and others, recommended magnesia as an antidote for arsenic and other metallic poisons. M. Carles, supposing that sugar (as in the case of lime) would, by rendering magnesia soluble, increase its efficacy, tried the mixture of sugar, water, and magnesia; but, to his surprise, found that it rendered the arsenite of magnesia soluble, and that sugar tends to prevent the formation of arsenite of magnesia; and is therefore useless and pernicious.

When, however, saccharated magnesia is used with the salts of lead, copper, antimony, and mercury, it hastens and facilitates their decomposition without uniting with them; and in some instances the sugar of itself acts by reducing the oxides. For this last reason it may be better to use honey in lieu of sugar.

In conclusion, *except in the case of arsenic*, the association of sugar with magnesia, augments the efficacy of the base employed as a general antidote. Two and a half drachms of magnesia, five or six drachms of sugar, and three fluid ounces of water (boiling), appear to be the most convenient proportion.

Preparation of Carbonate of Baryta. J. Creuse. (*Amer. Journ. Pharm.*, xliii., 15.)

The author recommends the following process for the preparation of pure precipitated carbonate of baryta from the native mineral witherite. Take of witherite, in lumps or in powder, any convenient quantity; add to it four or five times its weight of water, and dissolve it with hydrochloric acid, gradually added. Stop the addition of acid before the mineral is entirely dissolved, so as to have an excess of baryta, rather than an excess of acid. Allow to settle, and decant the clear liquid; to this add a solution of oxalic acid as long as a precipitate is formed; a slight excess is not objectionable. Thirty grains are generally sufficient for each pound of witherite, though the proportion may vary according to the purity of the mineral. Allow the liquid to stand one hour; filter, and add to the filtrate a quantity of caustic soda, just sufficient to give it a decided alkaline reaction. After an hour's rest, filter again, and treat the liquid by a solution of carbonate of soda. Collect and wash the precipitate in the usual manner.

This process is founded on the fact that when a solution of oxalic acid is added to a liquid containing salts of lime and baryta, all the

lime is precipitated first and immediately, while baryta is only affected after some time. The lime being thus eliminated, caustic soda precipitates all the foreign bodies likely to be present, such as iron, alumina, copper, lead, etc.

Substitution of Salts composing the Bones. (*Lancet.*, 1870, i 828.) That certain salts entering into the composition of the bone can be substituted by others belonging to the same series, if supplied in the food, has been long known. Some good experiments, however, have been made in the course of the past year by M. Papillon, and are recorded in the *Comptes Rendus*. In one of these a young pigeon was dieted on distilled water to which hydrochlorate, carbonate, sulphate, and nitrate of potash were added, and with grain made into a paste with strontia. The bird remained in perfect health for nearly eight months, when it was killed, and an analysis made of its bones, with the following results:—In 100 parts there were of lime 46·75, of strontia 8·45, of phosphoric acid 41·80; and of phosphate of magnesia 1·80; residue, 1·10. In a second experiment a white rat ten days old, was subjected to a similar regimen, except that phosphate of alumina was substituted for the strontia given to the pigeon in the proportion of about a grain and a half per die. The animal remained to all appearance in good health for about six weeks, when it died suddenly in convulsions. An autopsy showed the presence of intense enteritis. Analysis of the bones showed that in 100 parts, there were of alumina 6·95, and of lime 41·10 per cent. Another animal of the same litter, was supplied with phosphate of magnesia, instead of phosphate of alumina, and was killed at the same time. Analysis of its bones showed the presence of magnesia in the following proportions in 100 parts. Magnesia 3·56, lime 46·75. In all the animals the appearance presented by the bones was natural, and they seemed to possess their ordinary physiological peculiarities.

The Bones of Paralytic Patients. J. C. Brown. (*Chem. News*, xxii., 207.) In consequence of the frequent occurrence of fractures in the ribs of patients in lunatic asylums, the author was induced to make analyses of several specimens of rib bones from general paralytics.

The general appearance of all of them was very unlike the ribs of healthy adults. The results obtained, indicate that the ratio of organic constituents to earthy matter is much greater, and also that the ratio of lime to phosphoric acid, is distinctly less in the ribs of paralytics than in those of healthy adults. There are the same differences between the composition of healthy ribs and those of paralytics, as between the composition of the adult large bones and

those of the fœtus. And generally, the composition in cases of paralysis approaches that observed in cases of osteo malacia. Whether the defects in the ribs of paralytics are due to arrested development, or to degeneration of the fully developed bone, it will require further experiments upon carefully selected cases to prove; but from the evidence already obtained, the author is led to conjecture that both causes will be found to operate, but principally the former.

Several cases illustrating the tendency to fracture in the bones of the insane have been reported in the medical journals during the past year.

Iron and Hydrogen. Dr. Klein. (*Chem. News*, xxii., 155.) The author, a pupil and collaborator of Professor Jacobi, of St. Petersburg, states that the iron obtained by electrolysis is not, as has been often thought, the pure metal, but, on the contrary, a compound or mixture of iron and hydrogen, which, when heated to redness, gives off an enormous amount of that gas, and becomes, while greatly increasing in bulk, a silver-white, very soft, ductile, and malleable metal, which decomposes water readily below its boiling-point and oxidises most rapidly.

Impurities present in Reduced Iron. E. Schering. (*Neues Jahrbuch f. Pharm. Vorwerk*, 1871, and *Chem. News*, xxiv., 73.) While this substance has hitherto not been obtained quite free from a more or less large quantity of sulphuret of iron, the author calls attention to the fact—an important one, indeed—that he has met with samples of this medicament which, in addition to the impurity spoken of, also contain oxides and carburets of iron, and even cyanide of potassium, due in all likelihood to the reprehensible practice of preparing the reduced iron from the residues of the preparation of cyanide of potassium from the ferrocyanide of potassium. It is therefore advisable for pharmacutists to test the ferrum hydrogenio reductum they purchase for the presence of the cyanide alluded to.

Saccharate of Iron. F. Gerhard. (*Journ. Pharm. d'Anvers*, 1870, 290.) According to Hager, the most simple method of preparing saccharate of iron is to precipitate a given quantity of perchloride of iron by an alkali, and to perfectly wash the resulting peroxide. A small quantity of caustic ammonia is added to the moist oxide, which is then dissolved, with the aid of heat in a syrup of sugar. By this process a solution can be obtained containing a definite quantity of iron. All other modes of preparation are more complicated and more costly.

If it is wished to obtain the product in a still greater state of

purity, the syrup solution may be treated with alcohol, the precipitated compound washed with spirit and pressed, then redissolve in a small quantity of water. This operation is repeated three times. The product thus obtained while humid is soluble in water and in syrup; but when it has been completely dried in the air, it becomes insoluble in these liquids. The moist precipitate contains a certain quantity of ammonia which is lost during drying. When it has become insoluble, however, it may be easily dissolved by the addition of a little ammonia; a very small quantity of alkali, potash, or ammonia, in presence of sugar, suffices to maintain the saccharate of iron in solution. By precipitating the ammoniacal saccharate of iron by alcohol, and afterwards adding powdered sugar, a mixture is obtained which can be completely dried and even strongly heated without losing its solubility. This is probably due to the absorption of ammonia by the sugar, with which it contracts a very stable combination. It is known that powdered sugar in the dried state can absorb about five per cent. of ammonia.

The solutions of saccharate of iron may be boiled without changing so long as the liquid contains ammonia.

Soluble Peroxide of Iron. Koehler and Horneman. (*Journ. de Pharm.*, 4th series, xii., 213.) The authors recommend the following process for the preparation of a peroxide of iron soluble in water:—Equal weights of simple syrup and a solution of perchloride of iron containing 15 per cent. of peroxide of iron, are mixed together, and caustic soda added until the precipitate at first formed is dissolved. The filtered liquid is diluted with a large volume of water, and raised to the boiling point. In the presence of a neutral salt like chloride of sodium, the peroxide of iron is precipitated as the soluble modification; it is collected on a filter, washed, and dried. The powder so obtained is soluble in water, in syrup, and in glycerine. It is without taste, and can therefore be taken medicinally without repugnance; moreover, it is easily absorbed by the system. It has been tried as an antidote for arsenic with much success. Care should be taken to avoid its association with substances containing tannin.

Soluble Peroxide of Iron. Siebert. (*Journ. de Pharm.*, 4th series, xi., 478.) This oxide is prepared by dissolving sugar in a solution of permanganate of iron, and adding dilute solution of ammonia also containing sugar. The clear liquid thus obtained is mixed with four or five times its bulk of concentrated alcohol. A flocculent yellowish brown precipitate separates, which is collected and washed with alcohol. When dried it contains 43.59 per cent of oxide of iron. This com-

pound of oxide of iron and sugar is a brown tasteless powder, easily soluble in cold water, and precipitated from its aqueous solution by boiling. Dissolved in water it does not give the reactions of iron with ferrocyanide of potassium or a sulphocyanide. Tannin produces a precipitate after some time, and sulphide of ammonium precipitates the iron immediately. Even the weakest acids decompose it, and then the ferrocyanide gives the characteristic blue precipitate. A ferruginous syrup may be prepared from this compound, having a fine red brown colour, and a taste which is not disagreeable. The administration of such a preparation of iron in medicine presents several advantages.

Dialysed Oxide of Iron. (*Archiv. de Pharm.*, Oct. 9, 1870.) Berlandt, in Bucharest, recommends to prepare a solution of moist, recently precipitated oxide of iron in sesquichloride of iron, and enclose it in a well-washed hog's bladder, the opening of which connects with an open glass tube; the bladder is suspended in a beaker filled with water, and the chloride of iron dialyses out completely in eight days, leaving an aqueous solution of peroxide in the bladder.

Ferruginous Sugar. (*Journ. de Pharm. d'Anvers*, 1870, 267.) Dissolve two parts of iron in twenty-four parts of nitric acid (sp. gr. 1.2); add twenty-four parts of sugar dissolved in twelve parts of ammoniacal water. A deep brown liquor is obtained, gelatinous at first, but becoming bright by agitation. It contains nitrate of ammonia and saccharate of oxide of iron. After twenty-four hours, four or five times its volume of alcohol is added, which precipitates the iron and sugar. The precipitate is collected on a filter, washed with alcohol, dried between blotting paper, and mixed while fresh with its own weight of powdered sugar; then dried in a stove.

Thus prepared it is in the form of a brown powder, soluble in water and weak spirit, reprecipitated by boiling.

By dissolving this compound in a little water, and mixing the solution with simple syrup, an agreeable syrup of iron is obtained, which may be flavoured with tincture of orange peel.

On Syrup of Iron Oxide Saccharate, and the Determination of its amount of Iron Oxide. (*Pharm. Centralhalle*, 1871, p. 57.) This preparation is in extensive use in Germany, and the iron saccharate prepared by Ottmanns, in Oberndorf an der Oste, may be considered as excellent. Many other druggists have undertaken the production of this saccharate, and thus the author, whose name is quoted in connection with these preparations, thought it interest-

ing to submit some of them to analysis to determine the amount of iron oxide they contain. There are two kinds of saccharates, the syrups, and the dry preparations. The latter, however well prepared and however easily soluble in the beginning, always become, in course of time, more or less insoluble. Of the syrup, a firm in Prag prepares two kinds, one mixed with some rum, the other with some vanilla. These additions are improvements; even children take the syrup with decided pleasure. It has often been said that a medicine ought not to be pleasant, as it would induce people to take more than prescribed; but in the case of the iron saccharate, no harm whatever could arise, since the blood does not take up more iron than it requires, all excess of iron leaving the body unassimilated. Both the above syrups contain 1.45 to 1.5 per cent. of anhydrous iron oxide, and the liquids are perfectly clear. Another liquid iron sugar, prepared in Olmütz (Austria), professes to be stronger than other preparations, but contains only 1.365 per cent., and is moreover turbid. On permitting it to settle, and then determining the amount of iron in the clear liquid, it was found to be only 1.33 per cent. It may be, this liquid was in its freshly prepared state quite clear, but then it is not a stable preparation. Now, the value of the iron saccharates consists in the iron being soluble, and thus capable of easy assimilation. To determine the amount of iron oxide in a saccharate, the author recommends the following method:—About 10 grammes of the saccharate are diluted with 150 c.c. or more of water, heated in a capacious beaker glass, mixed with 10 drops of nitric or acetic acid, of 25 per cent. strength, and permitted to boil just for a moment. After this, 16 to 20 c.c. of ammon-acetate solution are added to the liquid; it is again boiled; after boiling, 15 to 20 drops ammon-carbonate solution are added to it, so that all free acid may be neutralised, and ammon-carbonate be a little in excess. Having boiled it for 10 to 15 minutes, the liquid is allowed to settle, the precipitated iron oxide is collected on a filter, washed with hot water, then dried together with the filter, and after wetting of the latter with a drop or two of nitric acid, ignited in a porcelain crucible. The ignited residue is once more damped with some nitric acid, dried, again ignited a little, and after cooling weighed. The basis (except it was ammonia) which served as dissolving medium of the iron oxide in the sugar solution can be determined in the liquid filtered off from the iron oxide by adding to the latter nitric acid, evaporating it to dryness and igniting the residue. Whether the iron saccharate had been made up by mixing dialysed iron oxide with sugar solution (which mixture, however, is already recognisable

by its styptic after-taste, a taste almost wholly absent in the iron oxide saccharate), will be shown by the presence of sulphuric or hydrochloric acid. It must, however, be considered that traces of these acids occur also in the ordinary iron oxide saccharate.

Iodate of Iron. C. A. Bell. (*Pharm. Journ.*, 3rd series, i., 624.) There appears to exist, at least three well-defined compounds of ferric oxide and iodic anhydride. One of these, the biniodate, is formed by precipitating a solution of iron alum by one of potassic or sodic iodate added in excess. This is the compound recently proposed for use in medicine, and to it the formula $\text{Fe}_2\text{O}_3, 2\text{I}_2\text{O}_5, 8\text{H}_2\text{O}$ has been correctly assigned. When first precipitated it is of a yellow or yellowish-brown colour; but it soon becomes darker on exposure to air, at the same time evolving an odour of iodine. If now to a solution of ferrous iodide one of potassic chlorate be added, and then an excess of strong nitric acid, upon heating the mixture a fine yellow precipitate is produced. The formation of this substance is often remarkable, the iodine which was at first set free disappearing suddenly when the yellow precipitate appears. The composition of this precipitate corresponds to the formula $\text{Fe}_2\text{O}_3, 3\text{I}_2\text{O}_5$ or $\text{Fe}'''3\text{IO}_3$. It is, therefore, a normal iodate. It contains 9.64 per cent. of iron and 65.57 per cent. of iodine, while the percentages of iron and iodine in the crystallised ferrous iodide of the Pharmacopœia are about 15 and 67. It is scarcely soluble in cold water and dissolves with difficulty even in strong nitric acid. Like other iodates it is readily attacked by warm moderately dilute hydrochloric acid, chlorine gas being produced. Boiling water takes up from it both ferric oxide and iodic anhydride, a basic salt remaining undissolved. It is destitute of both flavour and odour. It possesses the advantage over the preceding compound of being anhydrous and perfectly stable. The most suitable proportions for its preparation seem to be, two parts iodine converted in the usual manner into ferrous iodide in solution in 5 or 6 parts water, 2 parts potassic chlorate dissolved in a small amount of hot water, and $1\frac{1}{2}$ parts strong nitric acid.

When only a small quantity of nitric acid is added and the mixture heated to boiling, a considerable amount of iodine escapes, while a deep red precipitate is formed. The composition of this precipitate, when dried at 212°F ., appears to be normally $\text{Fe}_2\text{O}_3, \text{I}_2\text{O}_5$. It soon, however, decomposes, even during washing, and the proportion of iodic anhydride is accordingly liable to vary. Prepared with a larger quantity of nitric acid its colour is lighter, while it contains a greater percentage of iodic anhydride. When the amount of acid is not quite sufficient to cause the formation of the normal salt, the

resulting precipitate is probably a mixture of normal and basic iodates. Digestion with warm dilute nitric acid converts any of these basic mixtures into the neutral compound.

Of these three ferric iodates, the normal compound would seem the best suited for medical use, in consequence of its great stability. The iodates as a class undoubtedly require further examination.

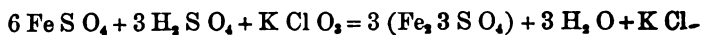
Process for Preparing Liq. Ferri Tersulphatis and Liq. Ferri Subsulphatis, U.S.P., without the Formation of Noxious Gases
By J. Creuse. (*Pharm. Journ.*, 3rd series, i., 970, from *The Physician*.) The best method for preparing the persulphates of iron perfectly pure is, undoubtedly, to run a stream of chlorine gas through a solution of the protosulphate previously acidulated with the proper quantity of sulphuric acid. But this is obviously impracticable to most pharmacists. The Pharmacopœia of the United States prescribes to oxidize the protosulphate of iron by means of nitric acid, a certain proportion of sulphuric acid being added. This is more practicable, and yields a good product, but is liable still to several objections. Expensive vessels are required for boiling a mixture of sulphuric and nitric acid; a good draught is also necessary for the escape of the nitrous fumes; and very often during the operation the vessels are broken, or the operator is annoyed by the poisonous gases escaping into the room. For these reasons, many pharmacists prefer to buy the article ready made; they have to pay a high price for it, and to depend on the manufacturer for its strength and purity.

The author proposes this new method, by which any pharmacist may prepare his own liq. ferri tersulphatis or his liq. ferri subsulphatis on his very prescription-desk, if need be, and with the usual implements found in all drug-stores.

R. Sulphate Iron in coarse powder, . . .	12 troy ounces.
Sulphuric Acid	2 troy ounces and 60 grains.
Chlorate of Potash	348 grains.
Boiling Water	12 fluid ounces.

Dissolve the sulphate of iron in the boiling water, in a glass matrass, or any convenient bottle. Add the sulphuric acid gradually, and, while the liquid is hot, add the chlorate of potash by small portions. When all is dissolved, filter and complete 24 fluid ounces. The whole operation need not take more than fifteen minutes.

The following equation explains the reaction:—



This process has the advantage of giving out no fumes or smell

any kind; the product is free from any acidity but what belongs to the salt itself.

It is true the persulphate of iron thus obtained contains a small quantity of chloride of potassium, but this does not interfere with any of the uses for which it is wanted by the pharmacist.

The nitric acid always present in the preparation of the Pharmacopoeia is much more objectionable. Besides, any one who has followed the official process knows that it is always when one tries to get rid of the last traces of nitric acid that the porcelain or enamelled dishes are broken.

A slight modification of the formula will give the liquor ferri subsulphatis U.S.P. :—

R Sulphate of iron, coarse powder, . . . 12 troy ounces.
Sulphuric acid 1 troy ounce and 30 grains.
Chlorate of potash 340 grains.
Boiling water 10 fluid ounces.

Operate as above, and evaporate to 12 fluid ounces. Filter.

The Volumetric Estimation of a Persalt of Iron. (*Zeitschrift für Chemie*, vi., 252). M. Oudemans employs a standard solution of hyposulphite of soda for the titration of perchloride of iron. To the iron solution he adds an excess of hydrochloric acid, then several drops of a solution of a salt of copper, and sufficient sulphocyanide of potassium to give the solution a red colour. The standard solution of hyposulphite is then dropped in from a burette until decolorisation is effected. The reaction takes place better at a temperature of 40° C. than it does in the cold. It is well to proceed slowly towards the end of the process. The nature of the change which occurs is represented by the following equation :—



According to the author, the copper acts as a carrier in the process, being reduced to a subsalt by the hyposulphite, and then in its turn reducing the iron, and passing back to its original state.

Chloride of Aluminium as a New Antiseptic. (*Lancet*, Aug. 27, 1870.) The hydrated chloride of aluminium, to which Mr. John Gamgee has recently drawn the attention of medical men, and of the general public, appears to be a valuable antiseptic. It is quite as potent as chloride of zinc or carbolic acid, and is at the same time non-poisonous, and devoid of unpleasant smell of every kind.

The most economical process for the preparation of the hydrated

chloride of aluminium appears to be by double decomposition between sulphate of alumina and chloride of calcium (both of which are cheap commercial products). When solutions of these two salts are mixed together, sulphate of lime is formed, and appears as a precipitate, whilst the hydrated chloride of aluminium remains undissolved.

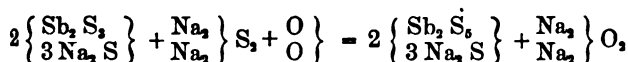
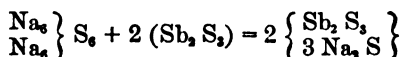
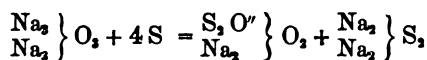
On allowing the aqueous solution to evaporate at a very gentle heat, and afterwards cooling, crystals of hydrated chloride are produced. If an attempt be made to drive off the water from the hydrated chloride by the application of heat, decomposition will take place. Hydrochloric acid is evolved under these conditions, and oxychloride of aluminium is formed, and, by pushing the process, alumina is obtained as the ultimate fixed product.

Manufacture of Alum. An anonymous correspondent of the *Pharm. Journ.* (3rd series, i., 460), gives the following brief outline of the manufacture of alum as carried on at Mr. Spence's works at Manchester and Goole, where 250 tons of this salt are turned out weekly:—

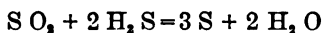
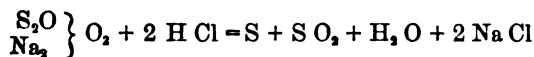
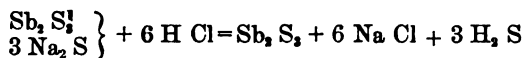
The shale of the coal measures is calcined in long ridges, it is then put into iron vessels lined with lead, sulphuric acid from the chamber is then poured over it, and the mass allowed to digest at about 230° F. to 240° F. The temperature is kept up by steam and ammonia vapour, which are blown in, and also by a small fire underneath the pans. When the solution is strong enough to crystallise it is drawn off into large coolers, and there agitated to prevent the formation of large crystals; the alum-flour so obtained, is washed and redissolved by steam, and the solution run off into crystallising tubs, where it remains for ten days or a fortnight: the mother-liquor is then run off, and the alum is broken up, and is ready for the market.

Golden Sulphide of Antimony. F. Wurtz. (*Journ. de Pharm.* 4th series, xi., 456.) Golden sulphide of antimony, prepared by the wet process, always contains sulphur in the free state. The author has verified this by dissolving out the sulphur with sulphide of carbon. What is the origin of this sulphur? From the following considerations, the author attributes its presence to the simultaneous formation in the first part of the process of hyposulphite of soda, and sulpho-antimoniate of sodium. The compound is obtained (according to the author) by digesting at a gentle heat for 48 hours, a mixture of sulphur, sulphide of antimony, carbonate of soda, and lime, in distilled water. The lime acts on the carbonate of soda, and forms caustic soda.

this caustic soda produces with the sulphur, hyposulphite of soda and sulphide of sodium. This sulphide of sodium, and the sulphide of antimony give sulphantimonite of sodium; but as there is an excess of sulphide of sodium in presence of the sulpho-antimonite and of the oxygen of the air, there is formed sulphantimoniate of sodium and caustic soda, which, in presence of a new quantity of sulphur, continues the same chemical movement.



After digestion, the filtered liquid contains sulphoantimoniate of soda and hyposulphite of soda. In precipitating this liquor with dilute hydrochloric acid, it is clear that we throw down some sulphur from the decomposition of the hyposulphite, and the sulphurous acid which ought to be evolved at the same time, meeting with the sulphuretted hydrogen which is being simultaneously disengaged from the decomposition of the sulpho-antimoniate, reacts upon it, forming sulphur and water.



It remains to prove that hyposulphite of soda really exists in the solution containing Schlippe's salt. This the author does by treating the liquid with an excess of ammoniacal nitrate of silver. A precipitate of sulphide of antimony and sulphide of silver is obtained, and the filtered liquid, when conveniently concentrated gives evidence of the presence of hyposulphite on treatment with an acid; sulphur is thrown down, and a very sensible disengagement of sulphurous acid occurs.

Bismuthi Subcarbonas. T. P. Blunt. (*Pharm. Journ.*, 3rd series, i., 44.)

The author directs attention to the circumstance, which may not be generally known, that the commercial "subcarbonate of bismuth"

(Bismuthi Carb. P.B.) contains an appreciable quantity of silver, in the form of chloride.

He has been in the habit for some time of preparing liq. bis muthi by the solution of the above salt in nitric acid, and though samples from various sources have been used, there has also appeared a heavy and very finely divided sediment, which passed with readiness through a filter, and could only be removed by subsidence and decantation; as this proved a source of some annoyance, he determined to ascertain the nature of the insoluble matter, when it was found, as above stated, to consist of chloride of silver.

The amount was ascertained as follows :—

1000 grains of the subcarbonate of bismuth were dissolved in nitric acid, the sediment allowed to subside, and the supernatant fluid decanted off as closely as possible; the residue was washed with nitric acid by decantation, and a large excess of strong ammonia was then gradually added, the precipitated oxide of bismuth was thrown on a filter, and repeatedly washed with ammonia water.

To the filtrate, a slight excess of nitric acid was added, the precipitate collected on a filter in the usual way, dried, ignited in porcelain capsule, treated with nitro-hydrochloric acid, and again gently ignited; it weighed 1·3 grains, representing 0·98 grain metallic silver, or about 0·1 per cent. This proportion is obviously of no importance from a therapeutic point of view; it might, however, be worth while for large makers to separate it in the course of manufacture, as might readily be done by some such process as that given above, without any loss of bismuth.

Report on Commercial Specimens of Bismuthi Subnitras. *The Practitioner* for March (No. 33, 1871, p. 191), contains a report analyses of six samples of bismuthi subnitras, which yielded the following results :—

No.	Oxide of Bismuth.	Arsenic.	Chlorides.	Sulphates.
I.	Per cent. 81·33	None	Traces	Minute traces
II.	78·51	None	None	Traces
III.	79·28	None	Traces	Traces
IV.	82·12	None	Traces	Traces
V.	81·80	None	Strong traces	Slight traces
VI.	82·37	None	Very strong traces	Traces

The amount of oxide of bismuth contained in the pure subnitras is 76·3 per cent.; but much depends upon the amount of washing

and the temperature maintained during precipitation. These may cause the quantity of oxide of bismuth contained in this salt to vary from 76 to 84 per cent. The only impurities detected in the samples examined were traces of chlorides and sulphates and very minute traces of iron. All were specially examined for arsenic, but no trace was found in any of them.

The Reaction of Potassic Iodide with Subnitrate of Bismuth. W. B. Woodman, M.D., and C. M. Tidy, M.B. (*Brit. Med. Journ.*, 1870, ii., 603.) An out-patient attending the London Hospital was taking the bismuth mixture of the Hospital Pharmacopœia, when it was thought advisable to add iodide of potassium to the previous prescription. When she came the following time, she appeared much alarmed at a red precipitate in the mixture, which she supposed to be "red lead," purposely put in by some neighbour, the sediment having been almost colourless when she reached home. As no mention is made in the ordinary textbooks of materia medica of the decomposition which takes place, although it is doubtless well known to metallurgists, it occurred to the authors to examine the reaction a little more closely. The change takes place slowly, and appears to consist in the formation of an iodide of bismuth, potassic nitrate remaining in solution.

This iodide of bismuth is a dark-red substance of cubic form, and seems to be a simple iodide, which is almost insoluble both in water and in excess of potassic iodide. Some of its properties are curious. It is a very insoluble substance; for, in addition to what is mentioned above, it may be added that saturated solutions of chloride of ammonium, chloride of sodium, ferrocyanide of potassium, and corrosive sublimate, do not dissolve it in any appreciable proportions. Acetic acid dissolves it slightly, without effervescence. On boiling with liquor potassæ or ammonia, the hydrated oxide of bismuth (H Bi O_4) is produced, which is insoluble in excess of either reagent. On treating this iodide with strong nitric acid, there was active effervescence; fumes of iodine being given off, a blackish, metallic-looking substance being left, entirely soluble in spirit, which proved to be pure iodine.

Acid nitrate of bismuth remained in solution, which was not precipitated by a small quantity of water, or until neutralised.

With hydrochloric or sulphuric acid there was no effervescence, but iodine was again precipitated; with the latter some iodic acid was formed. Oxalic acid also decomposed the salt, setting free the iodine; the action being somewhat slower than it was in the case of the mineral acids.

A few trials of it in doses of 5 to 20 grains appear to indicate that it is not an energetic therapeutic agent, which is probably be ascribed to its comparative insolubility.

On the Preparation of Subacetate of Lead by the Cold Process. M. Nerning. (*Journ. de Pharm.*, 4th series, xi., 402.) When the preparation is made with heat, the acetate of lead is liable to dissolve excess of oxide of lead, and insoluble basic acetate thus produced, forming a white flocculent precipitate, which renders the liquid turbid. To obviate this inconvenience, Nerning proposes to operate as follows:—Put the water, litharge, and acetate of lead into a bottle, and let them stand, with frequent agitation, for twenty-four hours, then filter. The solution thus obtained answers all the purposes for which it is required in pharmacy; and, if kept in a well-stoppered bottle, it will remain clear even when kept for a long time.

Liquor Plumbi Subacetatis. Stewart Kellam, (*Amer. Jour. Pharm.*, xliii., 248).^{*} As it is of considerable interest to the pharmacist to know the strength of the basic acetate of lead solutions of the different Pharmacopœias, the author has, in the laboratory of Dr. F. A. Genth, carefully prepared and examined them with reference to their specific gravity, and the amount of oxide of lead which they contain. The materials used for such preparations were first examined qualitatively. The acetate of lead was in thick, starry crystalline masses; the interior brilliant, and only the outside slightly coated with a more basic acetate; it was free from copper and contained no other impurities.

The litharge, on the contrary, was of far less purity. Four samples were examined from different sources; they all contained carbonic acid and minute traces of silver; two of them also metallic lead, and red oxide of lead; two were contaminated with oxides of iron and copper, with alumina and lime; and the other two showed besides the impurities mentioned, silicic acid and tetroxide of arsenic. As it is so very easy to obtain the pure oxide of lead by calcination of the pure carbonate, it is advisable to prepare always the pure oxide for pharmaceutical preparations. The solutions of the subacetate were prepared, both with the purest of the examined samples of commercial litharge, and with chemically pure oxide of lead.

I. Prepared according to the Pharmacopœia Badensis:—190 parts of sugar of lead are digested with 222 parts of oxide. The aut

^{*} An inaugural essay upon passing the examination for the degree of Graduate in Pharmacy of the Philadelphia College of Pharmacy.

tried the process by digesting, in a close flask, 12 grms. of acetate of lead with 14 grms. of litharge and 60 c.c. of distilled water for two days. The mixture, after a short time, had assumed a thick, pasty consistence, from the formation of a large percentage of the so-called $\frac{1}{2}$ acetate, and yielded such a small proportion of liquid that further experiments were not made.

II. According to the Prussian Pharmacopœia :—3 parts of acetate of lead are digested in a close flask for one or two days, with 1 part of litharge and 10 parts of water, and the product filtered after cooling, which then should have a specific gravity of 1.235 to 1.240.

An experiment made with 18 grms. acetate of lead, 6 grms. of litharge, and 60 c.c. of water (distilled) gave, after digestion and filtration from the small quantity of undissolved basic acetate, a clear liquid, which, however, after several days, deposited a slight precipitate. The specific gravity was found to be 1.238; and 19.3255 grms. of the liquid gave, when precipitated with sulphuric acid, and after the expulsion of the liberated acetic acid by evaporation, 5.0258 grms. sulphate lead, equal to 19.14 per cent. of oxide of lead.

III. The Bavarian Pharmacopœia takes, for 3 parts of acetate of lead, 1 part of litharge and 8 parts of water, and boils down the mixture till the liquid has acquired a specific gravity of 1.360. According to Wittstein ("Chemisch-Pharmaceutische Præparate"), it is easier and better to take only one-half the quantity of water. The experiment was made according to Wittstein; 18 grms. of acetate of lead, with 6 grms. of oxide of lead, were digested with 33 grms. of water, and, after filtration, a clear liquid was obtained of 1.376 specific gravity. 12.5856 grms. gave 4.8464 grms. sulphate of lead, equal to 28.34 per cent. of oxide of lead.

IV. The Pharmacopœia Gallica uses the same proportions of acetate and oxide of lead as the Bavarian; hence it did not seem necessary to repeat the experiments with these proportions.

V. The Pharmacopœia Britannica prepares the liquor plumbi subacetatis by taking 5 ounces (avoird.) of acetate of lead, $3\frac{1}{2}$ ounces of litharge, and 1 imperial pint of distilled water; boils for half an hour, constantly stirring the mixture; filters after cooling, and adds water to make the product 20 ounces. The specific gravity is 1.260.

For the experiment 20 grms. of acetate of lead, 14 grms. of litharge, and 60 grms. of water were taken, and the required quantity of water added to the product to produce 60 grms. of liquid. The

specific gravity was found to be 1.353. 18.0218 grms. gave 6.5408 grms. sulphate lead, equal to 26.71 per cent. of oxide of lead.

VI. Several experiments were made with the process recommended in the U. S. Pharmacopœia, with commercial litharge as well as with chemically pure oxide of lead, and, for comparison with these, others by using the cold process recommended by M. Nerning.*

1. *Hot process*.—The required specific gravity of the product is 1.267.

(a) 16 grms. of acetate of lead with 9.5 grms. of litharge, and 64 grms. of distilled water were boiled for half an hour. The product was a clear liquid of 1.265 specific gravity. 9.5588 grms. gave 2.9403 grms. of sulphate of lead, or 22.64 per cent. of oxide of lead.

(b) The same proportions of ingredients were used, but pure oxide of lead in the place of litharge. The specific gravity of the product was 1.234. 14.2815 grms. gave 3.7053 grms. of sulphate of lead, equal to 19.09 per cent. of oxide of lead.

(c) A repetition of the last experiment with a sample of acetate of lead from another source, gave a liquid of 1.230 specific gravity, 11.4528 grms. of which gave 2.9068 grms. sulphate of lead, equal to 18.68 per cent. of oxide of lead.

2. *Cold process*.—The same proportions of the requisite substances were allowed to remain, with frequent agitation, in contact for twenty-four hours; and in experiment (a), made with litharge, gave a liquid of 1.243 specific gravity, of which 19.3736 grms. gave 5.2476 grms. sulphate of lead, which is equal to 19.93 per cent. of oxide of lead.

(b) Repeated with pure oxide of lead, a liquid of 1.242 specific gravity was obtained, of which 15.2463 grms. gave 4.1196 grms. of sulphate of lead, or 19.88 per cent. of oxide of lead.

(c) A third experiment, which was made with acetate of lead from another source, yielded a liquid of 1.220 specific gravity. 13.14 grms. of the same gave 3.23 grms. of sulphate of lead, which represents 18.09 per cent. of oxide of lead.

From these experiments it will be seen that the liquores plumbi subacetatis obtained by the different Pharmacopœias are very different products. The same process also gives products of not exactly the same composition; as the same care was used in each case, differences of nearly 2 per cent. in the amount of oxide of lead (as found between No. VI. 2, a and c), can only be accounted for by the very low temperature at the time of the preparation.

* See page 182.

As a general observation, the author adds, that the preparations made in the cold appear to keep better than those obtained by boiling; the latter more readily depositing basic salts.

Preparation of Calomel. O. Oldberg. (*Amer. Journ. Pharm.*, xliii., 155.) The author gives the following, which he regards as a practical working formula, and preferable to the process of the Pharmacopœia, for the preparation of calomel:—

One pound of pure nitric acid (sp. gr. 1.25) is put in a matrass, heated by means of a sand-bath, and one and a half pounds of mercury (or an excessive quantity) is added. They are warmed together first until no more red fumes are evolved, and afterwards the digestion is continued for one hour more, or until the liquid begins to become discoloured or yellowish, when the matrass must be at once removed, and the contents transferred to a capacious evaporating-dish. The solution now contains a basic protonitrate. (The digestion must not be interrupted, because crystals may deposit which are afterwards very difficult to redissolve.)

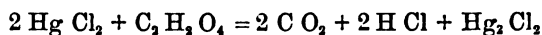
To the warm concentrated solution in the evaporating-dish is now added, without delay and during constant agitation, a boiling hot mixture of twelve pounds of distilled water and half a pound (more) of the nitric acid. This free acid is added, in order to prevent subsequent precipitation of basic salt, when water is mixed with the solution. The mixture, thus diluted and acidulated, should now be tested, to ascertain that it can be further diluted with water without decomposition, because, otherwise, basic salt may be thrown down with the calomel when the solution is finally added to the dilute hydrochloric acid. The solution is next filtered, to free it perfectly from all basic salt which may be undissolved. (This operation is, of course, not performed until the liquid has first become cold.)

The precipitation now follows by pouring the clear, cold, filtered solution of basic protonitrate of mercury into a mixture of one and three-quarter pounds of hydrochloric acid (sp. gr. 1.18) and twenty pounds of water, stirring uninterruptedly. The precipitate is washed by decantation, and the washing afterwards finished on a filter. It is necessary that the mercurial solution should be added to the dilute acid, and not *vice versa*, in order to prevent the possible contamination of the preparation with protonitrate.

The preparation obtained in this manner is a snow-white impalpable powder, which, if it has been well washed, is as perfectly free from bichloride and basic nitrate of mercury, as Jewell's hydro-sublimate of calomel.

Simple Method for the Preparation of Mercurous Chloride

(Calomel). Dr. Uloth. (*Neues Jahrbuch f. Pharm., von Dr. F. Vorwerk*, Mar., 1871, and *Chem. News*, xxiii., 238.) This paper records a series of experiments made by the author, for the preparation of calomel by causing oxalic acid to act upon mercuric chloride (corrosive sublimate), whereby, provided the operation is assisted by good sunlight, there is formed carbonic and hydrochloric acids and mercurous chloride, according to the equation:—



The conclusion come to by the author is that this method—although attended with some loss, because, practically, there is not obtained as much calomel as there should be according to theory—is yet available in practice, since, with due care, the resulting calomel is very pure, while a real loss of mercury is not actually sustained, some of it being recovered as oxide.

On the Reduction of Silver Chloride in the Wet Way. Dr. Grager. (*Dingl. Polyt. Journ.*, cc., 105, and *Journ. Chem. Soc.*, ix., 499, 1871.) The silver chloride is dissolved in ammonia; the solution put into a stoppered bottle; and zinc, in moderately sized pieces, is gradually added, until all the silver is reduced. The precipitate is washed by decantation till free from ammonia, and then poured through a funnel into a second bottle. The funnel is partly filled with pieces of glass, so as to allow the fine precipitate of silver to pass but to retain the larger sized pieces of zinc. The precipitate is not repeatedly treated with strong hydrochloric acid, and, if necessary, even boiled with it, until the dark grey colour is changed into white. The silver is now again washed with distilled water, treated with ammonia, to remove traces of silver chloride formed; and, finally, once more washed, first by decantation and lastly on a filter. The silver so obtained is perfectly pure. An ammoniacal solution of silver nitrate may be treated in the same way; and even if it contains copper, as obtained by the solution of silver coins for example, pure silver will be obtained, provided the quantity of zinc employed is insufficient to precipitate all the silver present.

Recovery of Silver Nitrate from the Silver Bath. These solutions generally contain, besides the silver, salts of ammonium, cadmium, zinc, iron, and copper. To separate these metals, the solution is boiled for some time with freshly precipitated pure silver oxide; the clear filtered solution is evaporated to dryness, and the residue fused to expel ammonium salts, when pure nitrate of silver is left. The precipitate, which contains the excess of silver oxide used, is best kept in the moist state, and may be employed in a second

operation in place of fresh oxide, until all the oxide of silver contained in it is dissolved.

The Solubility of Chloride, Bromide, and Iodide of Silver in Salts of Mercury. M. H. Debray. (*Journ. de Pharm.*, 4th series, xii., 23, 276.) The author shows that chloride of silver is soluble to an appreciable extent in mercuric nitrate; and that by dissolving it with heat, crystals of the argentic chloride may be obtained as the solution cools. If the chloride of silver obtained from one gramme of the metal be heated to 100° C. with 10 to 12 grammes of mercuric oxide, 50 c.c. of water, and sufficient nitric acid to dissolve the oxide of mercury, the chloride of silver will disappear, little by little; and, on cooling, it will be deposited in octahedral crystals, which are unalterable by light, because they retain a little mercury. But the cold solution will still contain an appreciable quantity of silver: about 0.3 grammes. To separate the amount thus retained, it is necessary to evaporate the liquor to dryness, and calcine, to decompose the nitrate of mercury. On treating the residual mixture of oxide of mercury and chloride of silver with dilute hydrochloric acid, the chloride is left insoluble. Mercuric acetate dissolves chloride of silver with much greater difficulty. A concentrated solution of the acetate, containing 23 grammes of mercuric oxide, dissolves with difficulty the chloride from 0.1 gramme of silver at 100° C. The amount dissolved in the cold is still less.

Well-washed chloride of silver, put into a very dilute solution of mercuric chloride, changes its aspect. It is bleached, if it had already commenced to blacken by light; and, if it is agitated, it becomes divided, and only deposits slowly. It has absorbed traces of the mercuric chloride, but without forming any definite combination, because the mercury may be completely removed again by washing with pure water.

The bromide and iodide of silver are also very soluble in a concentrated solution of mercuric nitrate, and crystallise out, on cooling, in their habitual form.

The same thing happens with calomel, which dissolves by heat in solution, even dilute, of mercuric nitrate, and is deposited again almost entirely on cooling, in very definite crystals. Twenty-five grammes of calomel dissolve easily in half a litre of a solution containing 50 grammes of mercuric oxide in the state of nitrate. The chloride which deposits again on cooling, when dried on a porcelain tile, retains only traces of the nitrate, and these can be removed by washing: thus showing that no combination of the two compounds takes place.

Mercurous nitrate also dissolves notable quantities of calomel with heat, and deposits fine pearly crystals by slow cooling; but the calomel is much less soluble in mercurous nitrate than in mercuric nitrate. Nitrate of silver is even capable of dissolving a minute quantity of chloride of silver. It may frequently be seen that the nitrate of silver of commerce gives, with a little water, a clear solution, which becomes troubled when diluted. Although the quantity of chloride dissolved by the nitrate is very small, especially in the cold, nevertheless it is possible to transform the amorphous chloride of silver into crystals, by alternately heating and cooling it in contact with a concentrated solution of nitrate of silver.

Preparation of Peroxide of Silver: Boettger. (*Zeitschr. f. Chim.*, vi., 82.) The electric current generated by two cells of Bunsen is passed by means of platinum electrodes through a *concentrated* solution of silver nitrate, placed in a wide cylindrical beaker; the position of the electrodes ought to be vertical, and about three inches distance from each other. Under the positive pole a small watchglass is to be placed, which will serve to collect the peroxide appearing at this pole. A few minutes after the establishing of the circuit, fine inch-long needles of the peroxide are formed at the positive pole; whilst at the negative pole, an equivalent quantity of pure metallic silver in dendritic branches is separated.

On Chloride of Gold. By H. Debray. (*Comptes Rendus*, lxi., 984.) It is well known that gold chloride breaks up at about 200° into protochloride of gold and chlorine, and at still higher temperature into gold and chlorine. Yet it is possible to sublime chloride of gold without decomposition. Thin sheet gold, in a glass tube heated to 300°, is exposed to the action of chlorine. Much below that temperature the metal becomes covered with chloride but towards 300° the combination begins to volatilize, and condensate in the colder parts of the tube in long needles. The peculiar phenomenon that chloride of gold decomposes at 200°, yet can be sublimed at 300°, is explained through the difference in the circumstances: in the latter case the chloride, is surrounded by an atmosphere of chlorine, which stops the forces of dissociation.

On Starch and Cellulose. F. A. Flückiger. (*Arch. Pharm.*, 2, cxlvi., 7-31, and *Journ. Chem. Soc.*, ix., 543, 1871.) The author, having obtained a fresh supply of lerp-manna, resumed his former researches on this substance. Lerp-manna occurs on the leaves of *Eucalyptus dumosa*, and consists of white threads clotted together by a syrup proceeding from the insect (*Psylla Eucalypti*) which spins those threads. It consists in round numbers of water

14 parts; threadlike portion, 33 parts; sugar, 53 parts. The threads possess many of the most characteristic properties of starch, from which, however, they are sharply distinguished by their form. When lerp is washed with water, the sugar dissolves, and the threads swell but slightly, dissolving to a small extent, so that the solution is coloured blue by iodine. The threads, freed from sugar by washing, consist of a substance called by the author, *Lerp-amylum*.

Lerp-amylum is very slightly soluble in cold water; not perceptibly more so in water at 100°, but entirely soluble to a thin transparent liquid when heated to 135° in sealed tubes with 30 parts of water. This solution, on cooling, deposits the original substance in flocks, without forming a jelly at any time. The separation is almost complete.

If the material employed in this experiment were originally free from sugar, the liquid left after the separation of the flocks will also be sugar-free. The flocks deposited from solution are insoluble in boiling water; therefore *lerp-amylum* suffers no chemical change on being heated to 150° with water. Heated in the air-bath to 190° while dry, it turns brown, and is afterwards reduced only by solutions of iodine; at the same time, it becomes partly soluble in hot water; hence it appears that *lerp-amylum* undergoes a change similar to that which occurs when starch is converted into dextrin. By oxidation with nitric acid, it yields oxalic acid, but no mucic acid; it is neutral to vegetable colours, and is not precipitated by lead acetate, and is therefore not to be confounded with the gums, etc.

Ultimate analysis gave—

	Calculated.	Found.	
C ₁₈	44.4	43.7	43.07
H ₂₀	6.2	6.6	6.4
O ₁₀	—	—	—

Like starch, *lerp-amylum* rotates the plane of polarization to the right; also, on digestion with dilute sulphuric acid, etc., it forms a crystallisable sugar which agrees in its properties with dextrin. It is insoluble in ammonia cuprate, and is homogeneous.

Though the behaviour of *lerp-amylum* to iodine and to water, and its insolubility in cuprammonia distinguishes it from cellulose, it is to be borne in mind that there are forms or conditions of cellulose which are blued by iodine and dissolve in water. As it appeared that *lerp-amylum* constitutes a perfectly homogeneous substance,

analogous to starch, the author considered it advisable to examine into the truth of the statements made by so many writers, "that the granules of starch have coatings of cellulose," since the evidence on which that statement was made did not appear to him to be conclusive. According to the best authorities, cellulose is characterised by—insolubility in water, solubility in cuprammonia, and inability to form a coloured compound with iodine directly, i.e., with iodine in absence of acids or salts; and it is stated, that when starch is treated with saliva, pancreatic juice, pepsine, etc., the granules are dissolved, and the cellulose, having the above properties, is left. The author cannot confirm these statements, but shows that saliva, for instance, when employed in insufficient quantity, dissolves a portion of the starch, with production of such an alteration of the properties of even the dissolved part, that iodine no longer causes the production of a blue colour, and that the portion left undissolved is therefore probably only starch so far changed as to have lost the power of forming a coloured iodine compound. He found further, that when starch is digested at 100° with ten times its weight of glycerine diluted with an equal quantity of water, a large portion dissolves to a liquid which is sufficiently thin to allow that which remains undissolved to be separated by filtration, and to be subsequently thoroughly washed out with hot water without forming a paste. This undissolved fraction, which, if not pure cellulose, should at least contain a very much larger proportion of that body than the original material, takes a pure blue colour throughout its mass when treated with iodine in aqueous solution, and does not yield more of its substance to ammoniacal cuprate than does unaltered starch; and what small portion is dissolved cannot be reprecipitated by addition of an acid. He therefore concludes that it is not established that starch-granules contain cellulose. As the paper is mostly argumentative, an abstract can give but a very incomplete idea of its value.

Soluble Iodide of Starch. A. Petit. (*L'Union Pharm.*, 1870, xi., 289.) Iodide of starch has been used in French pharmacy, chiefly in the form of syrup; and a process for its preparation has been given by Soubeiran. M. Petit, however, does not consider Soubeiran's method to be quite satisfactory, and has proposed the following, by which an iodide of starch of constant composition can be easily obtained in a perfectly soluble condition:—

Iodine	12 grammes.
Starch	100 "
Ether	q. s.

live the iodine in the ether, pour the resulting solution over arch, and triturate until the ether has completely evaporated. The product in a porcelain capsule, and expose it to the heat boiling water bath for half an hour, with occasional stirring.

treatment is sufficient to render it entirely soluble in hot r. On the first application of heat the vapour of iodine is red in some quantity, but this soon ceases almost entirely. n samples, variously prepared, gave by analysis the same lts; they contained four per cent. of iodine, corresponding to formula $(C_6H_{10}O_5)_{20}I$.

he excess of iodine employed in this process is necessary to the llt; attempts were made to employ only the quantity theoretically ssary, but the resulting compound proved to be insoluble. author is of opinion that the iodine causes a modification of the ch. Having obtained a soluble iodide of starch, the preparation he syrup is easily effected.

R. Iodide of Starch	25 grammes.
Hot water	345 „
Sugar	635 „

iodide is first dissolved in the hot water, and then the sugar led. The product contains one gramme of iodine per kilo., l each spoonful of 20 grammes corresponds to 20 milligrammes iodine.

Inulin and its Modifications. Lefranc. (*Journ de Pharm.*, 4th ies, xii., 166.) Inulin exists in the roots and tubers of the different ats producing it in a viscous condition, dissolved in the vegetable ces, while the organs of the plant are possessed of life. Freezing complete dessication can alone cause the inulin to assume the alent condition.

Since inulin while under the influence of vegetable life is in ondition which admits of its being transported through the nt by the sap, it might be assumed that when the spring returns, the period of active growth resumes, it has not to undergo e transformations through which starch, for instance, passes er similar circumstances. But this assumption is incorrect, inulin has been shown by Professor Buignet in his investigations manna, to pass through a series of changes which are completely parable to the modifications of starch under the influence of tase. Further, the transformation of inulin in the natural e, takes place in certain species even at the time when plant- is at rest, and to such an extent that when spring arrives the

whole work has been finished. The *Helianthus tuberosus* and the roots of *Inula helenium* offer us examples of this peculiarity, whilst on the other hand the roots of *Dahlia* and *Atractylis* prove the immobility which inulin can sometimes maintain during the repose of vegetation. The amount of inulin in those roots is in spring the same as in autumn.

Braconnot was the first to observe that the quantity of inulin contained in the *topinamburs* (Jerusalem artichokes) commenced to diminish from the day of the harvest; since then Dubrunfaut has stated that towards the month of March or April the inulin has completely disappeared. With regard to the root of *Inula helenium* this property has not yet been mentioned. It was an analysis of some roots collected in the month of March which made the author acquainted with it. It can also be well observed in the dried roots of commerce. After repeated extractions according to the ordinary methods, a mere trace of inulin only was obtainable from these roots; hardly five parts in 100, instead of 36, the normal proportion, as shown by V. Rose and John.

It is, then, with the roots of *Inula helenium* as with the *topinamburs* whether they remain in the earth, or whether they are collected and preserved; they undergo a kind of complimentary maturation, in the manner of those of our fruits which only ripen on the shelves. This after-ripening of the roots brings about the partial or complete transformation of the inulin.

The products of this transformation studied in the *topinamburs* (whose juice being very little charged with other extractive matters, are very suitable for this kind of analysis), are represented by a white, viscous substance of gum-like appearance.

Braconnot and Boussingault have in their analyses indicated its existence, but without any other definition. G. Ville and Joulie have separated from it what they call *levulin* (*Mon. Scient.* 1866, 836), and Dubrunfaut (*Comptes Rendus*, 1er sem., 1867, 764) an uncrystallisable sugar, which is optically inactive, and according to him, analogous to that which is found in the fermentation of inverted sugar. This uncrystallisable sugar and cane-sugar according to Dubrunfaut, the transformation products of inulin in the *topinamburs*, formed in the period between autumn and spring.

The results of the author's researches on this matter are as follows:—

1. The *topinamburs* are already in March or April without inulin. This result depends of course on climatological conditions, which are changeable in different years.

2. The products of the transformation of inulin are chiefly a soluble modification of inulin, lævorotatory as inulin itself, and an uncrystallisable, optically inactive sugar, which latter has been recognised already by Dubrunfaut; subsidiary products are cane-sugar, and inverted sugars, the latter derived partly from crystallisable sugar, partly from Dubrunfaut's sugar, or *inulose*, as it is proposed to call it.

The author's soluble inulin corresponds nearly to the lævulin of Ville and Joulie. It is evidently this, minus the foreign products which gave it a gummy appearance. It is easy to understand how the lævulin of these chemists and the uncrystallisable sugar of Dubrunfaut remained confounded until now. These substances were confounded with one another partly through the identity of the methods of extraction which their authors made known, and partly through the similarity of the principal characteristics which had been attributed to them.

The lævulin and the inulose are obtained simultaneously by the following process, which though on the whole an imitation of the method employed by Ville and Joulie, and by Dubrunfaut, yet differs from it in certain details of operation; the difference in this case, however, being, to judge from the results, of great importance.

The juice of the topinamburs, after having been heated during a few moments up to the boiling point, is evaporated over the water-bath to syrupy consistency. This syrup is treated with a great excess of alcohol of 85 to 90 degrees, by which a viscous, gum-like product is separated, insoluble in strong alcohol, easily soluble in water. This watery solution is now clarified with subacetate of lead, the excess of lead removed by sulphuretted hydrogen, and the filtered liquid evaporated again to a thick syrup. This colourless syrup is again mixed with alcohol of 90°, which again separates the gum-like product. After treating this product with animal charcoal, it presents itself as a dense, milk-white, gummy matter, of no odour, but sweetish taste. Dissolved in twice its weight of water, and mixed with alcohol until a milky turbidity ensues, a dissociation takes place; the lævulin forms a starchy precipitate, whilst the inulose remains in solution. The latter is separated by distilling off the alcohol, evaporating the residue to a syrup, and treating the latter with alcohol of 90°. The inulose thus obtained has the look of glucose; it can be drawn out in long, shiny threads, is without odour, and possesses a sweetish taste.

The principal distinctive characteristics of lævulin and inulose are:—

Lævulin looks like starch. Is lævorotatory. Does not ferment.

Inulose looks like glucose. Is optically inactive. Does ferment.

Both are without effect on the cupro-potassic test, but after inversion with hydrochloric acid, both exert a reducing action.

According to Dubrunfaut the inulose ferments without losing its optical inactivity. According to the author's observations there appears at a certain period of the fermentation a lævorotatory glucose.

It may now be asked, are lævulin and inulose really the products of the decomposition of inulin, or is perhaps the lævulin a substance intermediate between inulin and inulose? This question could only be answered with scientific accuracy, by showing that the two always appear together in mutually constant proportions. But it must be admitted that the probabilities are in favour of the author's view.

Inulin in solution, when maintained during about 30 hours at the temperature of 100°, yields lævulin and inulose mixed with quantities of glucose derived from the inulose. This sugar is, in proportion as it is formed, completely inverted through continued boiling with water. Finally, the artificial modifications of inulin are capable of identification with those which this fecula undergoes naturally.

On Inuloid, a soluble Modification of Inulin. O. Popp. (*Archiv. Chem. Pharm.*, clvi., 190.) If the juice of the tubers of *Helianthus tuberosus* (Jerusalem artichoke) or of unripe dahlias (gathered when the inulin just begins to deposit in the cells) be treated with basic acetate of lead, in order to eliminate albumen, colouring matter, etc., there remains a colourless liquid, which, though clear for some time, becomes turbid after about six to twelve hours, and a voluminous, seemingly crystalline precipitate separates. This precipitate is washed first with water, then with water and alcohol, and dries to form a dazzling white amorphous substance, greatly resembling starch. It dissolves easily in water, but not in alcohol, and constitutes a soluble modification of inulin. It is distinguished from the ordinary inulin by its smaller specific gravity, and its greater solubility in water, but resembles it very much in its chemical reactions. This soluble modification of inulin, called *inuloid* by the author, in the present paper, is lævorotatory like inulin. Analysis showed it to contain one molecule of water, and led to the formula $C_6H_{10}O_5 + H_2O$. Inuloid does not reduce alkaline solution of cupric sulfate; on continued boiling, however, whereby the inuloid undergoes

goes decomposition, a voluminous precipitate separates. Boiled for some time with water, it is, without gelatinising, transformed into an easily soluble gummy mass. This transformation is still more quickly effected when heated with some acid in sealed tubes to 110° or 120° C. Boiled with dilute nitric acid, inuloid yields oxalic acid. Carefully added to concentrated sulphuric acid, sulpho-inuloid acid is formed, without production of lævulose. Boiled with ammoniacal sulphate of copper, a compound of the composition $C_6H_{10}O_5, Cu O$, is precipitated. In ammonia, and the other caustic alkalies, inuloid dissolves quite readily. With baryta, it enters into a combination having the composition $C_6H_{10}O_5, Ba O$. Inuloid, from whatever species of *Synanthreae* it is derived, is always identical. It contains one molecule of water which it loses by being heated to 105° C. Heated to 130° to 135° , it commences to fuse, and above 135° it turns brown and decomposes. Its solubility in water compared with that of inulin in the same solvent, is as 2 to 1. Regarding the state of solubility of the inuloid in the juice of the living plant, there are many indications that it is somewhat connected with synanthrose, probably united to it in a more complex molecule. This view is made plausible by the bearing of plumbic acetate to the fresh juice of the bulbs, where oxide of lead replaces the inuloid, and forms lead synanthrose; the inuloid, eliminated from its combination with the synanthrose, remaining at first soluble, and only later deposited, probably through molecular condensation. A further evidence for the above mentioned connexion is the spontaneous fermentation which the freshly obtained juice of the bulbs undergoes, when left to itself at a temperature from 10° to 12° C. First the inulin, which existed deposited in the cells, is separated; after about 16 to 20 hours an active fermentation sets in, and inuloid contaminated with colouring matters is deposited. The juice, originally of feeble acid reaction, is now strongly acid, and whilst before the fermentation, it chiefly contained synanthrose and inuloid, and only a little dextrorotatory sugar, there are now found in it dextrose and lævulose, the products of decomposition of synanthrose. The inuloid, expelled out from its solvent, the synanthrose, is thus separated. This fermentation, which may aptly be called inulinous fermentation, is produced through the albuminous bodies kept in solution in the juice; they have the same effect on the synanthrose dissolved in the juice, as yeast has upon the pure isolated synanthrose. The inuloid obtained in the fermentation of this latter kind is identical with that got in the above described manner.

The quickest and easiest way of isolating and purifying inuloid is

the following :—The bulbs of *Helianthus tuberosus*, or of the dahlia are collected before they have come to ripeness, mashed, and expressed. The juice is treated with lead acetate as long as a precipitate ensues, and then filtered. The filtrate is freed from the excess of the lead salt through sulphuretted hydrogen, separated from the lead sulphide formed, and concentrated over the water-bath to thin syrup. This syrup is repeatedly extracted with alcohol, which takes up glucose and synanthrose, and leaves the inuloid behind. This residue washed first with water, finally with water containing some alcohol, can be regarded as pure inuloid.

On Synanthrose; a New Sugar contained in the Synanthérées. O. Popp. (*Ann. Ch. Pharm.*, clvi., 181.) The author some time ago observed that the rhizomes of *Helianthus tuberosus* contain some other sugar beside dextrorotary glucose, because the total amount of sugar yielded by the juice was much larger than was indicated by the deflecting power or the reducing action on Fehling's solution. Subsequent investigation contradicted the supposition that the result was due to cane-sugar, and demonstrated the existence of a new variety of sugar, occurring in all the tuber-bearing composite plants. It occurs accompanying inulin in all stages of growth, but most abundantly in the ripe bulbs. The constant presence of this substance in the family of the *Synanthérées* induced the author to designate it synanthrose. Synanthrose is best prepared from the bulbs of *Dahlia variabilis*, because they contain it in the largest proportion and purest state; but otherwise the bulbs of *Helianthus tuberosus* are just as advantageous for the purpose. Comparative tests showed the identity of the glucose occurring in both species. The synanthrose was isolated in the following manner :—The freshly collected bulbs were pressed, and the juice obtained treated with basic acetate of lead to precipitate albumen, colouring matter, etc., the excess of lead eliminated by sulphuretted hydrogen; the solution, now containing free acetic acid, neutralised by magnesium carbonate, then filtered and evaporated over the water-bath to syrupy consistency. The residue was fractionately treated with small quantities of alcohol, until all the glucose was extracted, when the solution ceased to rotate polarised light. The body obtained on evaporation in the water-bath was completely amorphous, conchoidal fracture, and pale brownish-yellow colour. It contained yet water, which it persistently retained. It was treated with small quantities of spirit, which left the inulin behind. This alcoholic solution was then decolorised by animal charcoal, filtered, and poured in a thin stream into ether containing some absolute alcohol.

whereby the synanthrose separated as a white, amorphous substance. It was washed with alcohol containing ether, and dried in vacuo over sulphuric acid. The synanthrose thus obtained pure and anhydrous was a white, voluminous mass, extremely hygroscopic and deliquescent, easily soluble in water and dilute alcohol, but very little in absolute alcohol, and not at all in ether. It is chemically and optically inactive, does not reduce alkaline cupric tartrate solution, except after long continued boiling whereby however the synanthrose is decomposed. It does not rotate the polarised ray, but after inversion through acids it exhibits strong lævorotation. By treatment with dilute acids, it is transformed into lævulose and dextrose. It is, like cane-sugar, not directly fermentable; but after breaking up into lævulose and dextrose it does ferment in the ordinary manner, yielding alcohol and carbonic acid.

Caustic potash does not darken it in the cold; with concentrated sulphuric acid it becomes black, but less energetically than cane-sugar. A cold solution of synanthrose is precipitated by silver nitrate; on boiling reduction occurs. A solution of mercurous nitrate as well as Millon's reagent are, even in the cold, reduced by synanthrose. The neutral and basic lead acetate do not precipitate it. Lime and baryta water do not produce precipitates in aqueous solutions of the synanthrose, but on addition of alcohol to such mixtures, the sugar goes down in combination with the alkaline earths employed. There are no combinations formed of synanthrose with sodic chloride and other neutral salts. Submitted to dry distillation, synanthrose yields carbonic acid, carbonic oxide, and marsh-gas; the aqueous distillate contains acetic acid and acetone. The substance carefully dried in vacuo over sulphuric acid, gave on analysis figures which point to the formula $C_{12}H_{22}O_{11}$. Synanthrose is therefore isomeric with cane-sugar. The specific rotatory power of inverted synanthrose was found to be $(\alpha) = -54.09^\circ$.

The author proceeds to enumerate several metallic combinations of the new glucose, such as with lead, copper, etc.

With regard to the physiological rôle synanthrose plays in the vegetable organism, it seems that it is closely connected with the presence of inulin. Whether synanthrose is found only in some members of the family of the *Synantherææ* or whether it is a specific character of this great vegetable family, or whether it occurs also in families remote from the composites, the author hopes to establish by future investigations.

Dextrin Insoluble in Water. M. Musculus. (*Journ. de Pharm.*, xi., 451). In the course of his researches on the chemical constitution

of starch, the author was led last year to prepare a dextrin soluble in water, by heating starch with crystallisable acetic acid. dextrin is composed of fragments of starch grains, the organic matter of which has been preserved, in spite of the chemical modifications to which they have been subjected. This explains their insolubility in water. They can be rendered soluble by heating with water at 100 degrees during ten or twelve hours; after evaporation, a whiteish powder is then obtained, analogous to ordinary dextrin.

If, instead of evaporating to dryness, the evaporation be stopped when the liquid attains the consistence of syrup, and the syrup is thus concentrated, be placed in a cool place, it will be found to become cloudy after the lapse of some days. An insoluble precipitate is formed in the liquid, which may be separated by diluting the syrup with a large quantity of water. The precipitate is washed several times and dried. A white powder is thus obtained, which is the insoluble dextrin, but it is no longer formed of fragments of starch grains; it is an amorphous mass, in which no structure can be discovered by the aid of a microscope, not the slightest trace of structure can be discovered. It is insoluble in cold water. It dissolves in water heated to about 50 degrees, and is not precipitated on cooling, but by evaporating to dryness it again becomes insoluble. In a solid state, iodine will colour it brownish red, and a reddish violet when it is in solution. The same product is obtained by saccharifying starch with diastase, and stopping the operation at the moment when the liquid will give a reddish violet colour with iodine. The syrup obtained after filtering and evaporating, sets to a mass on cooling, unless the saccharification has been carried far. By this means a large quantity can be prepared.

By boiling the fecula with water acidulated with sulphuric acid, an insoluble dextrin may be also obtained; but this possesses different properties. The operation is stopped as before, when iodine produces with the liquid a red colour. In the present case the operation can be continued until the coloration by iodine becomes as in onion-peel. But this point must not be passed, or the insoluble dextrin will not be obtained.

The liquid is saturated with chalk, filtered, and evaporated to the consistence of syrup; filtered again to separate the excess of lime which is precipitated, and the product set aside in a cool place where the temperature does not exceed 15 degrees. After the expiration of twelve hours a slight cloudiness is visible; it is the dextrin which commences to separate; but instead of remaining suspended in the liquid, as in the preceding case, it is depos-

bottom, where the deposit becomes from day to day more abundant.

On examining this deposit through a microscope, it is found to consist of a multitude of small round grains. These grains are according to the length of time they have remained in the process; thus during the first eight days, their diameter is scarcely 0.001; in a month they attain the size of 0.010; at the end of three months 0.030. These refer to the largest, for they are found of all sizes, as in starch. The growth is caused by concentric layers. To examine this structure through a microscope, it is advisable to use an immersion object glass, and to weaken considerably the light by means of the diaphragm. The circular lines, the number of 5, 6, 8, etc., are then distinctly visible, regularly arranged round a central point. These grains are insoluble in cold water. They dissolve quickly in water heated to 50 degrees. They are not precipitated by cooling. They are again formed by evaporating the solution to the consistence of syrup. By evaporation to dryness, an amorphous matter insoluble in cold water is obtained, which much resembles the dextrin obtained by aid of diastase or hydrochloric acid, but which is distinguished from it, not only because it is capable of taking a granulated form when placed in convenient circumstances, but also on account of the colour communicated to it by iodine. With this reagent it gives a pure blue colour, unmixed with red, when in a solid state, and a vinous red colour, or even an apple-red, without a shade of blue, when in solution; whilst the starch, which remains always amorphous, is coloured reddish brown in solid state, and reddish violet when dissolved.

Iodine does not colour the grains of dextrin, but it disintegrates them if employed in excess.

On following the phenomenon under the microscope, one sees the circular lines gradually disappear, and soon nothing is to be seen but an amorphous matter of a uniform blue colour. In examining with a polarimeter the two varieties of dextrin now described, there is a difference noticeable in their rotatory powers. Their specific rotatory power is $(\alpha) = +208^\circ$. It is notably superior to that of ordinary dextrin which is $(\alpha) = +138^\circ$.

Purification of Dextrin. Dr. H. Hager. (*Wittstein's v. Schr.*, 1860, 113-115.) R. Forster has analysed some commercial dextrin and has the following results:—

Dextrin—72.45—70.43—63.60—59.71—49.78—5.84.

Sugar—8.77—1.92—7.67—5.76—1.42—0.24.

Insoluble matter—13·14—19·97—14·50—20·64—30·80—86·67.

Water—5·64—7·68—14·23—13·89—18·00—7·95.

The insoluble matter consists mainly of unaltered starch.

Dextrin is a very good vehicle for dry narcotic extracts; it has also been recommended by Becker for internal use as an excellent stomachic; for medicinal use, therefore, dextrin must be purified, which, according to Hager, is best accomplished in the following manner:—

10 parts dextrin are dissolved in a cylindrical vessel in 18 parts cold distilled water, by agitation; after standing, the clear solution is decanted or strained through flannel, and mixed with $1\frac{1}{2}$ to 2 volumes of 95 per cent. alcohol. The liquid is decanted from the doughy precipitate, which is dissolved in little distilled water, and the solution spread upon glass or porcelain plates to dry in a warm place.

Purified in this way and rubbed to powder, dextrin is a whitish or white powder which dissolves in distilled water to a clear, yellowish, nearly inodorous solution, of a mild and sweetish mucilaginous taste; diluted with water it must acquire merely a faint violet tinge with iodine water, owing to the presence of a small quantity of soluble starch, which is of no importance. To free the dextrin entirely from this starch, the clear, aqueous solution is mixed with enough alcohol to produce a strong turbidity, decanted after standing for a week, and then completely precipitated; or the impure solution of 10 dextrin in 18 water is mixed with 3 parts of alcohol, decanted after a week, and then precipitated by $1\frac{1}{2}$ volumes of alcohol.

On Sugar-Beets and Beetroot Distillation. A. Voelcker. (*Journ. Roy. Agricultural Soc.*, (2) vii., 60, and *Journ. Chem. Soc.*, ix., 433, 1871.) The existence of crystallisable sugar in beetroot, was first noticed in 1747, by Marggraf, of Berlin; the manufacture commenced about 1809, under the auspices of Napoleon I. There are at present on the continent, nearly 2000 beetroot sugar factories and distilleries, chiefly French, North German, and Belgian, producing in the year 1869–70, 689,500 tons of sugar. The manufacture of beetroot sugar was introduced into England three years ago by Mr. Duncan, of Lavenham, Suffolk, and the distillation of beetroot spirits is carried out on a large scale by Mr. R. Campbell, at Buscot Park, Berks.

Numerous analyses of sugar-beet grown in England and Ireland, are given by the author. The season of 1870 proved more favourable to the formation of sugar than 1869. Samples grown in 1869 gave—English roots, 8–12 per cent. sugar; Irish roots, 6–11 per

cent. sugar. Samples of the crop of 1870 gave—English roots, 9–13·3 per cent. sugar; Irish roots, 10–14·8 per cent. sugar. Large roots are shown to be more watery, and contain less sugar than smaller roots. Liberal manuring increases the bulk of the crop, but injures its quality, one effect being the increase of albuminous and saline matters, the presence of which prevents the crystallisation of a certain percentage of the sugar. The part of the root grown above the ground contains less sugar and more nitrogen than the buried portion; hence the utility of deep culture of the soil.

The distillation of spirit from beetroot is largely practised on the continent; it has been recently commenced in England on a great scale, by Mr. Campbell, of Buscot. This manufacture turns to profit the molasses of the sugar factories, and utilises the crops of bad seasons, when the percentage of sugar is below that (about 8 per cent.) required for profitable extraction. It is considered by many more remunerative than the manufacture of sugar, and is certainly more consistent with high farming. The albuminous and saline matter, favoured by liberal manuring, being no obstacle to the production of spirit.

Beetroot is prepared for fermentation by one of three processes:—

I. The roots are pulped or sliced, mixed with a small quantity of sulphuric acid, then pressed, and the juice fermented. II. (Champion's method.) The roots are sliced, and treated with hot wash acidulated with sulphuric acid; no press is used, the sugar being extracted by displacement. III. (Leplay's method.) The slices of beetroot are placed in vats, and fermented without previous treatment. The residual pulp from each of these methods is used as cattle food.

Beetroot spirit is very apt to be contaminated with fusel oil, but the use of first-rate distilling apparatus,—as that of Messrs. Lavalle,—effectually removes this impurity.

Since sugar-beet contains far more nutritive matter than the best mangolds, it may frequently be of more value for feeding purposes than for the sugar or spirit manufacture.

Extraction of Sugar from Beetroot and Cane. F. Kohn. (*Journ. Soc. Arts*, xix., 338.) At a meeting of the Society of Arts on the 15th of March, 1871, Mr. F. Kohn, C.E., read a paper on the "Different Methods of Extracting Sugar from Beetroot and Cane," in which he gave a description of a new process invented by Herr Julius Robert, of Seelowitz, in Austria,

one of the most eminent beetroot sugar manufacturers on the continent, which is a process of diffusion, dispensing entirely with the application of direct mechanical force, and based upon Graham's celebrated discovery of the osmotic properties of organic cells. By it the saccharine matter is extracted from the closed cells without bursting them open. The name of diffusion was given by Graham to a process which takes place when two liquids containing different bodies in solution are separated only by an organic membrane; the liquids mutually exchange their soluble matters and gradually equalize their degree of concentration. There is, however, a great difference in the speed with which this exchange and equalization take place; crystallisable bodies, such as sugar and salts, passing through the organic partition at a quicker rate than non-crystallisable, such as albumen and other nitrogenous compounds. By this property, therefore, the unbroken cells of beetroot or cane immersed in water or weak saccharine solutions are capable of yielding part of their sugar and salts to the surrounding liquid. A slice of beetroot or sugar cane, containing 10 per cent. of sugar in its juice, immersed in an equal weight of water, will gradually part with its saccharine contents until the juice in the cells and the water outside each contain 5 per cent. of sugar. If a fresh slice, containing 10 per cent., be placed in this 5 per cent. solution of sugar, the resulting equalization will produce a solution of $7\frac{1}{2}$ per cent. On the other hand, the partially-exhausted slice, containing 5 per cent. of sugar, will part with $2\frac{1}{2}$ per cent. of it to a fresh supply of water. Thus, by a series of operations, bringing the pure water into contact first with nearly exhausted slices, and then passing the weak saccharine solutions over slices which have parted with a smaller proportion of their sugar, the solution produced may be brought very nearly to the density of the natural juice of the plant; while the slices coming in contact successively with weaker and weaker saccharine solutions, and finally with pure water, give up nearly all their sugar and become completely exhausted. Another advantage resulting from this process is, that in consequence of the difference of speed between the diffusion of sugar and that of the nitrogenous compounds in a given time, which is sufficient for the proper proportion of sugar and soluble salts to pass into the surrounding liquid, only a small portion of the nitrogenous compounds will be given up; while the insoluble impurities are prevented entirely from leaving the cells of the plant and passing into the diffusion juice. Thus the juice produced by the diffusion process is always purer and less liable to spontaneous decomposition or fermentation than that expressed by mechanical

a. This process has been applied to beetroot and to sugar-cane with an equally complete and decided success.

In practically carrying out this system, the beetroots are first sliced, and then cut by machinery into slices of about $\frac{1}{4}$ in. or $\frac{3}{8}$ in. in width and thickness, and of a length according to the size of the battery. They are then ready for placing in the diffusion battery.

The battery consists of nine or ten cylindrical vessels, containing slices in different stages of exhaustion and juice of different degrees of density. When each portion of the operation is completed, the solution is conducted to the vessel containing the slices with the next highest proportion of sugar. Thus in each vessel in turn the slices having the least sugar are brought into contact with fresh water, and are discharged from it with only about $\frac{1}{2}$ per cent. of sugar; while at the other end of the process, the rich solution which has passed successively through the other vessels is passed into that containing the most exhausted slices, and is discharged thence into the clarifying-pan. The exhausted slices are equally valuable as a food for cattle with the juice obtained from the hydraulic press, but they hold a large surplus of water, which is a drawback when it is necessary to convey them from one place to another. This has been to some extent obviated by submitting them to the action of a hydraulic press, which removes the water without to any great extent expelling the elements of sugar.

In the sugar-cane the process is very similar, and it has been successfully carried out by a company in Madras. The juice so obtained is very pure; it has a bright yellow colour, and gives off very little scum in the clarifier. When the cane is perfectly ripe and in good condition, the diffusion juice requires no filtration through animal charcoal, and may be passed at once into the evaporators and vacuum pans, producing good high-class raw sugar. The diffusion juice, however, contains an excess of about 20 per cent. of water, the cost of evaporating which has to be taken into account. In balance this on the other side, the yield of juice by diffusion (when reduced to the natural density of the juice of the cane) is about 82 per cent. against 70 per cent. obtained by the mill. More-over, in consequence of its greater purity, a larger proportion of crystallisable sugar is obtained from it, amounting in some cases to 10 per cent. The capital and labour required for the two methods are about the same.

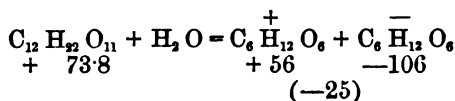
Mr Robert has recently invented a modification of his process, in which it is carried on in one vessel. The fresh slices are introduced at the bottom of a single vessel, and gradually carried upwards,

the solution as it becomes of greater specific gravity, in consequence of its increased richness in sugar, descending to the bottom, and being drawn off as concentrated juice.

The above processes for sugar extraction are equally applicable for the production of spirits, since the saccharine juice so obtained is easily fermented and rendered fit for distilling.

Inverted Sugar. James Dewar, F.R.S.E. (*Proc. Roy. Soc. Edin.*, and *Pharm. Journ.*, vol. i., 169, 1870.) For some time past, an animated discussion has been going on in the columns of the *Comptes Rendus de l'Académie des Sciences*, between MM. Dubrunfaut and Maumené regarding the nature of inverted sugar. M. Dubrunfaut, many years ago, made some valuable additions to our knowledge concerning the composition and reactions of various sugars, especially in explaining the result of the action of dilute acids on cane-sugar. He explains the lævo-rotatory action of inverted sugar, and its rapidly varying power with the temperature, as the result of a molecule of water, in reacting with a molecule of cane-sugar, generating one molecule of glucose and one of lævulose. Dubrunfaut believed that inverted sugar consisted of a mixture of glucose and lævulose in equal weights; and although he did not make a direct analysis of the product, yet he was justly entitled to assume that it was so constituted, seeing that, generally, it agreed with a mean of the properties of inulin, sugar, and dextrose.

In order to support the above view, he separated lævoglucose from the inverted sugar, through the insolubility of the lime compound, and compared its properties with pure lævulose. The decomposition would, according to Dubrunfaut, be as follows:—



So thoroughly had his facts and explanations been accepted by chemists generally, that up to a recent date, no one had discovered any flaw in his researches, and therefore no doubt was thrown on the validity of this theory. Recently, Maumené has reinvestigated the composition of inverted sugar by analysis. He has attempted to separate the two sugars through the action of chloride of sodium. The dextro-glucose forms a well-defined crystalline compound with chloride of sodium, whereas the lævulose does not form any compound. The results obtained by this method differ greatly from theory. Instead of finding 50 per cent. of lævulose, he found 6

percent. In repeating the experiments of Dubrunfaut on the separation of lævo-glucose by hydrate of lime, he has not met with any better results; in fact, his results are quite opposed to those of Dubrunfaut.

Apart altogether from expressing an opinion on the merits of the views entertained by the different parties to this discussion, the author has thought some observations of the same subject might not be unworthy of notice at the present time.

Linneman, many years ago, applied the process of hydrogenation to the sugars that he had found so successful in treating the simple organic substances. In the way named, he obtained mannite from inverted sugar, the following reaction taking place:—



Mannite had long been known to be the product of certain kinds of fermentation, and occurring as a secondary product in the vinous fermentation; but it was this elegant synthesis of Linneman that first clearly showed the connection. But although inverted sugar can be changed into mannite, the next point that demands a solution is the proving the inverted sugar to be composed of equal quantities of dextrose and lævulose. Are they both transformed by hydrogenation into mannite? or is only one of them, and which? Linneman seems to have directed his attention to the solution of this question. He states that it is only the lævulose that is so affected. The reasons why he entertains the above views are not given. In all likelihood he thought that, just as Berthelot had changed mannite by a peculiar fermentation into lævo-glucose, so would the lævo-glucose in inverted sugar be hydrogenized into mannite.

In repeating the action of sodium amalgam on inverted sugar, the author has not seen any reason why the one sugar any more than the other should be supposed to generate the mannite. The following is a description of the mode by which the sugar was inverted and hydrogenized:—20 grammes of cane-sugar were dissolved in 150 grms. of water, and inverted through the action of 2 grms. of sulphuric acid, keeping the solution at the temperature of 70° C., afterwards adding pure carbonate of barium, filtering, and then adding one gramme of sodium in the form of a weak amalgam. The action took place without any evolution of hydrogen. If the amalgam was impure from the presence of other metals, it evolved hydrogen at once, and the solution became brown; otherwise it remained perfectly clear. After one month, the solution gave no trace of sugar with the alkaline copper solution. It was then carefully neutralized

with dilute sulphuric acid, evaporated on the water-bath, the greater part of the sulphate of sodium separated by crystallisation, and the residue treated with boiling 70 per cent. alcohol, the solution filtered and allowed to crystallise. Sometimes the mannite did not crystallise until all the alcohol had evaporated, leaving a syrup that slowly assumed the crystalline form. The product had no rotatory power. In no case was the sugar entirely changed into mannite—a gummy substance was invariably left, that would not crystallise after exposure to the air for months. Mannitan or some similar body may be one of the products.

Dextro-glucose made from honey, gave mannite when treated in the same way, having exactly the same melting-point as ordinary mannite. In treating milk-sugar with dilute sulphuric acid, changing into gallactose and hydrogenizing, dulcitol was not isolated; but the author has not specially studied the reaction.

On some Saline Compounds of Cane-Sugar. C. H. Gill. (*Journ. Chem. Soc.*, ix., 269, 1871.) Peligot has described a compound of cane-sugar and salt, to which he ascribed a formula of $C_{24}H_{42}O_{21}NaCl$, which requires 14.92 per cent. of sodic chloride:—this indicates the replacement of 9 parts of water by 58.5 parts of sodic chloride. Bondeau de Carrolles subsequently examined a similar compound, to which he ascribed the formula $C_{24}H_{40}O_{20}NaCl \cdot 3H_2O$, which includes water of crystallisation of which Peligot makes no mention. Subsequently Mitscherlich denied the existence of the body, and Hochstetter mentioned that other chemists had failed to obtain it. Mr. Gill, being at first unsuccessful in preparing Peligot's compound by the method described, boiled a solution of sugar with an excess of salt for some time, filtered, and set aside the apparently uncrystallisable syrup. At the end of some months a few small, not very transparent, but individually distinct crystals, had formed. They were drained, rinsed, pressed and analysed. The numbers lead to the formula $2(C_{12}H_{22}O_{11}) \cdot 3NaCl \cdot 4H_2O$. This compound of an unexpected composition having been obtained, a number of solutions of sugar, with various proportions of different salts, were made up and set aside to crystallise. The salts employed were the chlorides of potassium, sodium, lithium, and ammonium, the bromides of potassium and sodium, and the iodides of potassium, sodium, lithium, and ammonium. In each case four solutions were prepared, having one, two, three, and four molecules of the salt to the double molecule of sugar, $2(C_{12}H_{22}O_{11})$. None of the potassium salts gave compounds of a definite composition. The mixture containing the chloride in the smallest proportion, gave crystals of pure sugar, those containing

the two largest proportions gave a crop of the pure potassic chloride.

The solutions containing potassic bromide behaved in a very similar manner, giving crystals often very clear and sharp, and sometimes five or six m.m. in extreme dimensions, but always *anhydrous* and of irregular composition. The solutions containing potassic iodide evaporated to very thick sticky masses, sometimes containing a number of minute crystals which could not be separated from the mother-liquor.

The sodium salts gave more definite results. In the case of the chloride, the solution containing least salt, first gave crystals of pure sugar, and then on further concentration deposited crystals, which are doubtless the same as those of the compound examined by Peligot, and are identical with those obtained from the liquid containing the next higher proportion of salt, viz., Na Cl to $C_{12} H_{22} O_{11}$. This compound crystallises in prisms terminated by pyramids, is very soluble in water, less so in spirit. When to its solution in spirit of not more than 75 per cent. ether is added, an oily layer is formed at the bottom of the vessel, and in this crystals form, which have the composition $C_{12} H_{22} O_{11}$, Na Cl, 2 H₂ O.

The solutions containing sodic bromide can hardly be made to crystallise at all. A small quantity of minute confused crystals were deposited after some months from the solution containing 3 Na Br to 2 $C_{12} H_{22} O_{11}$; these when pressed and dried over oil of vitriol gave numbers which would point to a formula, Na Br $C_{12} H_{22} O_{11} 1\frac{1}{2} H_2 O$, but it is more probable that when pure it is similar in composition to the analogous compound of sodic chloride.

The solutions containing sodic iodide give crystals of definite and constant composition with remarkable ease. These crystals always have the same composition, whatever the proportions of the constituents in the mixture, unless one be in such large excess that it can in part crystallise out before the liquid becomes saturated with the compound. The solutions containing a moderate excess of sodic iodide yield the best crystals and quickest growth. It can be recrystallised as often as desired from water or dilute spirit without suffering decomposition, forming large transparent crystals even from small quantities of solution. Their constitution is expressed by the formula 2 ($C_{12} H_{22} O_{11}$), 3 Na I, 3 H₂ O. None of the mixtures containing lithium gave any crystals other than those of sugar.

The mixtures containing ammoniac salts, gave no definite compounds.

No results were obtained from the solutions containing ammoniac iodide.

The crystals of sugar containing ammoniac chloride, and the equally distinct, though generally smaller ones, containing potassic bromide, and those deposited from a hot alcoholic solution of the lower salt-compound, must be built up by an *anhydrous* compound of the salt and sugar, isomorphous with sugar itself, crystallising out together with an excess of the latter.

That the crystals are not simply sugar with adhering ammoniac chloride is shown by their individual perfection, and by the fact that they are deliquescent, whereas neither constituent is so.

The solutions of all the bodies described in this paper, especially that of the lower salt compound, exhibit persistent supersaturation in a remarkable degree. A saturated warm solution, when cooled and shut up in an air-tight vessel with several crystals of the solid body, continues to deposit more of the compound for several months.

The composition of the sodic iodide compound makes it seem probable that the true molecular weight of cane-sugar should be represented by $C_{24}H_{44}O_{22}$.

The measurements of the various crystals mentioned in Mr. Gill's paper were kindly executed by Professor W. H. Miller.

Glucose. We learn from the *Grocer* that glucose is fast becoming an article of commerce. Some large parcels have been already received from the Continent, and, unless the lowness of the price obtained for it proves to be a bar to its free production, considerable quantities may be expected. It is offered in the form of huge blocks or cakes; but when specially prepared for the use of brewers, it undergoes a process of crushing that reduces it into small particles resembling grains of malt. It is not allowed by the excise authorities to enter a brewery in a liquid state. By some brewers, especially those interested in the production of pale sparkling ales, it is preferred to either malt or sugar for obtaining sound and wholesome liquors, in which there is none of that acidity, impurity, or treacherous sweetness which may be frequently detected in ales and beer brewed from the common classes of raw sugar. With confectioners, who require the addition of an almost colourless preparation for their more delicate manufactures, it is gradually taking the place of sugar.

Manufacture of Grape-Sugar from Corn. The *Boston Journal of Chemistry* says that large factories have been established in New Orleans, Buffalo, and Brooklyn, for making grape-sugar from corn. The latter is steeped in weak soda lye, for the purpose of softening the husk and gluten, and is then ground wet, and run through revolving sieves to separate impurities. It is afterwards made ~~to~~

flow through ways or troughs, in which the starch gradually settles as a white powder. The wash water is run into a large cistern, and allowed to ferment and produce a weak vinegar. The starch from the troughs is put wet into the mashtub, and treated with water containing 1 per cent. of sulphuric acid, for eight hours. The acid is neutralised with chalk or carbonate of lime, and the liquid evaporated to get rid of the gypsum; it is afterwards further evaporated in vacuum pans and run into barrels ready for crystallisation.

Glucose. Professor Charles A. Joy. (*Journ. Appl. Chem.*, June, 1870.) In the year 1811, Kirchhoff, a celebrated German chemist, discovered that it was possible to convert starch, by means of sulphuric acid, into sugar. Great expectations were founded upon the announcement of the discovery, as, in consequence of Continental wars and the English blockade, sugar had become a very dear article, and it was at first thought that an ample supply could be obtained in this way; but everybody was destined to be grievously disappointed as soon as the subject was more thoroughly investigated, and it was found that the sugar thus produced was of a different character from that to be obtained from the cane and beet. Still, the discovery of Kirchhoff was of great importance, and has led to many practical applications. It was soon found that glucose or grape-sugar could be made in several ways, and that it was always the product of the germination of starch grains, and sometimes occurred already formed in nature.

It is probable that both cane and grape sugar are formed from the starch contained in the cellular tissues of the plant, cane-sugar being formed first, and then grape-sugar, if acids be present. Acidulous fruits contain only grape-sugar, whereas cane sugar occurs in those that are free from stronger acids. The chief natural sources of the grape-sugar are in the sap of the grape vine, in plums, cherries, figs, honey, in the liver, and in diabetic urine; but it would not be economical to prepare it from any of these sources.

One of the latest methods for the preparation of grape-sugar is the one proposed by Maubré, and is as follows:—The mixture of dilute sulphuric acid and starch meal is boiled under pressure of six atmospheres. The necessary boilers are similar to those used for high-pressure engines, and are lined with lead and provided in the interior with a perforated lead tube for the passage of steam. The boiler is further furnished with safety-valve, stop-cocks, thermometers, etc. In the process of manufacture 56 lbs. of sulphuric acid of 66° B. are diluted with 5600 lbs. water, and heated to 212° F. A mixture of the same amount of acid and water is made in a

separate wooden vessel, the heat of which is raised to 86° F. In the second mixture 2240 lbs. of starch meal are well stirred and heated to 100° F. This is gradually added to the first mixture, and after heating with open valves for a few minutes to 212° F., the stop-cocks are all closed, and the heat raised to 320° F., and continued until all of the starch is converted into sugar, which requires from two to four hours.

The contents of the boiler are then run into a wooden tank, and 168 lbs. of pure chalk or carbonate of lime, previously stirred up with 500 lbs. of water, is gradually added to neutralise the acid; the gypsum is caught on a filter, and the filtrate evaporated to 20° B., and afterwards clarified by blood and bone-black, and again filtered. In this way the product is obtained pure, and free from bitter and empyreumatic taste, and is well suited for any of the purposes to which grape-sugar is adapted.

Another way is to convert the starch into sugar by means of malt. For this purpose 10 to 12 lbs. of barley-malt are well stirred with 400 lbs. of water, and to this is added 100 lbs. of starch, and the whole is heated to 158° F., and kept at that temperature for several hours, under constant agitation. At 158° F., the starch becomes pasty, the grains burst, and at first there are no signs of sugar; but in a quarter of an hour the liquid becomes more fluid, and begins to have a sweetish taste. Great care must be observed to retain the heat at the same temperature, not to have it either higher or lower than above indicated; and to ensure this, several thermometers ought to be put in different parts of the apparatus. After 6 hours the liquor can be filtered and clarified, and evaporated to a syrup. The sugar prepared in this way always retains the taste of malt, and is only adapted to use in breweries, where this property will not prove deleterious.

Grape-sugar, or glucose, can be prepared in open vessels, by allowing a mixture of starch and water to flow gradually, at a temperature of 130° F., into a vat containing water acidulated with 1 per cent. of sulphuric acid. By keeping it at the boiling-point the starch is at once altered, without producing mucilage. The amount of starch taken is usually about one-half the weight of water employed. After all the starch is added, boil for half an hour, and decant. The sulphuric acid is neutralised by carbonate of lime as before, and the liquid evaporated to the specific gravity of 1.28, and set aside to crystallise. The molasses is allowed to drain off, and the sugar is dried at a gentle heat in a current of dry air.

In the United States, especially in the West, it is more economical

to make grape-sugar from corn. There are several large establishments where this business is now extensively prosecuted. The corn is steeped in weak soda lye to separate the husk and soften the gluten. It is then ground wet and run through revolving sieves, by which the husks and gluten are separated. The starch flows through long ways and troughs, in which are slats against which the solid particles lodge, and thus separate from the water. The wash water is run into a large cistern, where it can be fermented into weak vinegar. The starch is put wet into a mash-tub, and treated with 1 per cent. sulphuric acid in sufficient water for 3 to 8 hours. Where it is intended to make sugar, the whole of the starch is converted; but if syrup is sought, then some part of the dextrin is left unaltered. The acid liquor is neutralised with chalk as before, and evaporated in vacuum pans; and after the separation of the gypsum, is run into barrels, and allowed to crystallise. For syrup a certain percentage of dextrin is left in the liquid unconverted, which helps to keep it from crystallising; and in the manufacture of syrup special care must be observed to neutralise all of the acids. The sugar is sometimes cast into blocks 6 inches square, and dried on plaster plates, in a current of dry air, as hot air would be apt to discolour it. It has been found that glucose can be made from cellulose as well as from starch, but the process is too expensive for practice; it is, however, interesting from a scientific point of view, and ought to be mentioned in this connection.

Two parts of clean linen shreds are gradually added to 3 parts of sulphuric acid, and they are allowed to stand 24 hours; the whole is then largely diluted, and the sulphuric acid neutralised by carbonate of lime or carbonate of baryta. In a similar manner any other kind of cellular tissue, as cotton, wood-shavings, paper, etc., can be converted into grape-sugar.

It is a singular fact that, although we can prepare grape-sugar from cane by the action of acids, no way is at present known by which glucose can be reconverted into sucrose. It would be a discovery of great importance if we could make cane-sugar from glucose, as in that event common sugar could be prepared from a great variety of refuse matters, and would be largely reduced in price.

There was a time when much grape-sugar was manufactured in England clandestinely, for the purpose of adulterating muscovado sugar; but this illegitimate business was destroyed as soon as the tariff on sugar was reduced. The price of cane-sugar must be very high before manufacturers can afford to make grape-sugar for its adulteration.

The starch of potatoes can be converted into glucose by digesting for a few hours with parings of the potato. This operation is largely practised by German farmers in the preparation of food for fattening hogs. The starch is rendered more digestible in this way, and from the glucose some of the larger proprietors manufacture alcohol, for which they obtain a high price.

An excellent starch-sugar can be prepared from Indian corn, which will yield alcohol one-eighth cheaper, and quite as pure as that from cane-sugar. As by a recent decision of our courts, the manufacturers of alcohol and vinegar from this source are not distillers within the meaning of the tax levy, the business is not hampered by licences, inspections, or stamp duties, and has thus a great advantage over ordinary distilleries.

In some parts of Europe large quantities of grape-sugar are used to add to wine; but in this country it is not so much the wine growers as the brewers who make such an extensive use of it as to give rise to its regular importation. This can hardly be justified, excepting in times when the price of barley is very high.

Formation of Grape-Sugar in Syrups. M. Hardy. (*Journ. Pharm. d'Anvers*, 1870, 301). The introduction of grape-sugar as a regular article of commerce, and the low price at which it is offered, renders it probable that it may occasionally be used to replace cane-sugar, either wholly or partially, in the preparation of the syrups of pharmacy. The author has therefore sought to ascertain whether such a substitution could be readily detected. For this purpose he has made a number of experiments to determine to what extent glucose exists, in syrups prepared with pure cane-sugar. He finds that all the cane-sugar of commerce, even the finest description, contains glucose in more or less notable proportion. Moreover, he finds that by keeping simple syrup prepared with cane-sugar, the proportion of glucose in it gradually increases. Thus a sample of syrup freshly prepared was found to contain 1.923 grms. of glucose per litre. After fifteen days it was again examined; and the quantity had risen to 18.2 grms. per litre. Some syrup was carefully prepared in the cold, without any clarification, from a selected sample of the finest sugar; the proportion of glucose in it was so small as not to be worth estimating. In three months time this syrup contained 8.16 grammes of glucose per litre. A number of medicinal syrups were also examined, and in many it was found that the formation of glucose proceeded more rapidly than in the case of simple syrup. Any incipient fermentation greatly augments this change. A sample of syrup?

lets three months old was found to contain 96 grammes per

presence of mould on the surface of the syrup (such as
 antly forms in the necks of the bottles in which syrup is kept)
 greatly assists the development of glucose. Some simple
 allowed to remain for about three months in a bottle not
 ered and only half full, became covered with mould, and con-
 124 grammes of glucose per litre. Of course in the case of
 syrups, the development of glucose goes on very rapidly.

author infers from these results that in syrups prepared from
 est cane-sugar, at least one-eighth of the sugar may frequently
 be converted into glucose by simple keeping. Consequently
 not easy to detect with certainty the fraudulent use of starch-
 by the reagents for glucose.

suggests, however, that such a substitution may be re-
 ised by the presence in the syrup of an undue quantity of
 ate of lime. Starch-sugar is prepared by the action of sul-
 ic acid, which is afterwards neutralised by chalk; and as
 ate of lime is not absolutely insoluble, this salt is present to a
 appreciable extent in the sugar. By the addition of chloride
 rium and oxalate of ammonia to the diluted syrup, the presence
 phosphate of lime might be easily recognised.

e juices of currants, cherries, raspberries, etc., contain salts of
 but do not contain sulphates, consequently the presence of
 -sugar in the syrups of these fruits would be indicated by the
 tion of a precipitate with chloride of barium.

w Test Solution for Sugar. J. Loewe. (*Zeitschrift für
 tische Chemie*, 1870, 20.) The author recommends the use of
 rin in place of tartaric acid for the preparation of an alkaline
 r solution for the detection of sugar. Glycerin entirely pre-
 the precipitation of oxide of copper, and the solution prepared
 it has the advantage of being less liable to alteration when
 than the tartaric solution is.

prepare a test liquid of this kind 16 grammes of sulphate of
 r should be dissolved in 64 c.c. of water; to this solution is
 ally added 80 c.c. of soda solution (1.34 sp. gr.), then 6 or
 names of glycerin, which redissolves the hydrated oxide of copper
 ad been precipitated.

is liquid should not become turbid when diluted with two-
 of bulk of water, nor when boiled.

e copper solution may also be prepared by dissolving hydrated
 of copper in a mixture of glycerin and caustic soda. The

hydrated oxide is best obtained by adding soda solution to an anhydrous solution of sulphate of copper, washing the precipitate with water, and drying over oil of vitriol.

For 6 grammes of this hydrated oxide there should be 6 grammes of glycerin, 50 grammes of water, and 56 grammes of solution of the strength above mentioned. This mixture is diluted as may be requisite. The author prefers this solution to others. It does not become turbid with alcohol.

The solutions will not bear considerable dilution without decomposing hydrated oxide of copper, but this may be prevented by increasing the proportion of glycerin or of soda.

New Method of Determining Grape-Sugar. Carl Knapp (Annal. Chem. Pharm., and Pharm. Journ., 3rd series i., 301.) Professor Liebig has mentioned the fact that the addition of prussic acid to a mixture of yeast-water with a solution of cane-sugar does not prevent the conversion of cane-sugar into grape-sugar by an organic substance in the yeast-water. After saturating such a mixture with oxide of mercury, adding caustic soda, and heating the liquid to boiling, a precipitate of metallic mercury is formed but no such precipitate is formed under the same conditions with a solution of cane-sugar mixed with an alkaline solution of cyanide of mercury.

Further experiments showed that an alkaline solution of cyanide of mercury is completely reduced to metallic mercury by grape-sugar, and at the suggestion of Professor Liebig, the author of the paper undertook to apply this reaction for the determination of grape-sugar. He now gives, as the result of his inquiry, the following method :—

A solution is made by dissolving 10 grammes pure dry cyanide of mercury in water, adding 100 c.c. caustic soda solution of 1 sp. gr. and diluting to 1000 c.c.

For determining the value of this solution, commercial grape-sugar was first dried at 100 C., then boiled with absolute alcohol till a saturated solution was obtained; the crystals which separate on cooling this solution were taken for use.

A series of experiments showed that 400 milligrammes of cyanide of mercury are decomposed by 100 milligrammes of anhydrous grape-sugar, on boiling them together in an alkaline solution.

The sugar determination by this method is conducted just as in the Fehling test: 40 c.c. of the cyanide solution is heated to boiling in a porcelain dish, and the sugar solution, containing about 0.5 per cent., added until the whole of the mercury is reduced.

quantity of sugar solution required for effecting this reduction will contain 100 milligrammes of grape-sugar.

On adding the sugar solution to the boiling alkaline liquid, a turbidity is at once produced, but this disappears again towards the end of the operation, and the liquid becomes slightly yellowish.

In order to judge of the progress of the operation, a drop of the liquid is from time to time placed on fine Swedish filter-paper laid over a beaker containing a little strong sulphide of ammonium. So long as any cyanide of mercury remains undecomposed in the liquid, a brown spot is thus produced upon the paper, and the end of the reaction is indicated when such a spot is no longer produced in this way. This point may be ascertained much more sharply by holding a drop of sulphide of ammonium on a glass rod immediately over the paper moistened with a drop of the liquid being operated on.

At first the entire spot becomes brown, but when the reaction is nearly terminated, only a pale brown ring appears round the edge of the spot; afterwards that is to be recognised only when the paper is held up to the light; and at last the spot remains quite unaltered. With some practice, $\frac{1}{2}$ half per cent. solution of grape-sugar can be titrated up to .1 c.c.

If at the end of the reaction the spot be allowed to dry on the paper, a pale brown ring of sulphide of mercury always makes its appearance, inasmuch as the solution always contains a trace of grape-sugar and a trace of cyanide of mercury, either of which is to be removed only by an excess of the other substance. This circumstance, however, does not interfere with the delicacy of the test, provided the colouration of the fresh spot be taken as the indication when the reaction is completed.

From a large number of experiments in which this method was adopted and compared with Fehling's test, the author has convinced himself that it is not inferior to the latter in accuracy, and though the results it furnishes are not better than those obtained by Fehling's method, there is an advantage in the new method requiring less time for making a determination, and a further advantage in the fact that the reduction of cyanide of mercury is not affected by foreign substances, such as alkaloids, which in some cases interfere with the colour of the suboxide of copper precipitate. But perhaps the chief advantage of the new method lies in the easy preparation of the standard solution, and its capability of being kept without alteration.

Contributions to the Knowledge of some Sugars (Glucose, Cane-sugar, Levulose, Sorbin, Phloroghicin). H. Hlasiwetz and J.

Habermann. (*Ann. der Chim. u. Pharm.*, 1870.) Some years ago one of the authors obtained, by treating milk-sugar in water with bromine, and subsequently with silver oxide, an acid of the composition $C_6H_{10}O_6$. It was to be expected that other kinds of sugar would yield analogous derivatives, and it appeared especially interesting to learn whether there existed any difference in this respect between the fermentable and the non-fermentable sugars. The authors have accordingly submitted representatives of each of the two classes to the above-mentioned treatment, varying it only by substituting chlorine for bromine.

I. *Grape-sugar.* It gives an acid of the constitution $C_6H_{12}O_6$, termed by the author gluconic acid. It is an almost colourless syrup, of a strong, pleasant acid taste, insoluble in strong spirit of wine, not precipitable from its watery solutions by metallic salts, and incapable of reducing Fehling's copper solution.

II. *Cane-sugar* gave an acid identical with gluconic acid.

III. *Sorbin.* The product of oxidation by means of chlorine and water was glycollic acid.

IV. *Lævulose* yielded, like the preceding sugar, glycollic acid.

V. *Glycerin.* It has by Barth already been observed, that under the influence of a halogen, glycerin in the presence of water is transformed into glyceric acid. Hlasiwetz and Habermann found this confirmed, but they obtained at the same time a body soluble in ether, which they suppose to be dichlorglycerin, $C_3H_5Cl_2O_3$.

VI. *Phloroghicin.* The product of oxidation in this case was dichloracetic acid.

Of the lengthy conclusions the authors draw from the results of their experiments, the following important deduction is to be mentioned: the fermentable sugars yield by the above described treatment an acid which contains the same number of carbon atoms as the respective sugars; whilst the sugars, difficult or wholly incapable of fermentation, are transformed into acids poorer in carbon.

Artificial Production of Dulcite. G. Bouchardat. (*Comptes Rendus*, lxxiii. 199.) By treating inverted milk-sugar with sodium amalgam (containing 2.5 per cent. of sodium) the author has obtained a substance, $C_6H_{14}O_6$, solid, crystalline, not capable of fermentation, fusing at 187° , difficultly soluble in strong alcohol and in cold water. This body therefore appears to be identical with the dulcite obtained from Madagascar manna, and the substance found in the juice of the *Metampyrum nemorosum*.

The Artificial Preparation of Mannite. Hirsh. (*Proc. Amer. Pharm. Ass.*, 1870, 128.) The investigation of this subject was under-

taken by the author, Joseph H. Hirsh, of Chicago, in answer to the following query issued by the American Pharmaceutical Association—"Can mannite be prepared artificially? and if so, how? And has it the same physiological properties?" The result has been but a partial success, in so far as the author could not in every instance obtain a product of exactly the same composition from the commercial glucose which formed the raw material. Trials with pure grape-sugar invariably failed to produce that peculiar nauseous principle characteristic of manna. The following is an outline of his experiments:—

Glucose was made in the usual manner from starch, leaving about 10 per cent. of dextrine still undecomposed, but the solution was not concentrated beyond 15° Beaumé. To this liquor was added 5 per cent. of wheat flour, 5 of molasses, and as much of common malt vinegar, when the mass was at a temperature of 100° F. In twenty-four hours a lively fermentation had set in, which continued for three days, when the liquid was concentrated; it possessed the peculiar nauseous taste and odour of manna. Digested with alcohol, mannite dissolved, crystallising upon evaporation of the alcohol, while dextrine and other impurities remained behind undissolved.

The peculiar nauseous principle appears to be partly decomposed matter, undergoing a gradual change into humus. Whoever has been in a vinegar factory, badly conducted, where poor ventilation produces an incomplete oxidation of the alcohol, must at once be struck by the resemblance of this odour to that of manna. It was this experience which led the author to a trial of the foregoing method of operating; the gluten of the wheat flour, forming together with the vinegar an excellent ferment of putridity, which not only produces the nauseous humus like parts existing in manna, but also the molecular change of cane or grape sugar which converts it into mannite.

This artificial manna, in its action as a laxative, equals the true manna. The author reserves for a future communication an account of the elementary analysis of the mannite produced from this source.

[Although the query of the American Pharmaceutical Association appears to relate only to *mannite*, the author has apparently sought to obtain also an artificial *manna*.—Ed.]

Glycyrrhizin. Joseph M. Hirsh. (*Proc. Amer. Pharm. Ass.*, 1870, 133.) The mode of preparing glycyrrhizin, mentioned in the last Dispensatory, by precipitating it from a cold infusion, was found highly impracticable, on account of the slight solubility of the

glycyrrhizin in cold water. Berzelius's method of preparing it from sulphate of glycyrrhizin gave but a dark-coloured product, difficult to purify, while Vogel's method of preparing a plumbate of glycyrrhizin, and subsequent decomposition with hydric sulphuret, is rather laborious. The best practical process appeared to be the preparation from an infusion made with *boiling* water of acetate of glycyrrhizin, which upon evaporation to dryness is dissolved in alcohol, when the acetic acid is neutralised with soda, the new salt crystallising out, while the glycyrrhizin remains in solution. Another method, giving good results, was found to be the preparation of an alcoholic extract by percolation, which was heated to the boiling-point, filtered, and evaporated nearly to dryness, redissolved in alcohol, from which solution it remained behind almost pure upon evaporation.

Experimenting with this product in regard to its relation to masking bitterness, the author found one part to cover the bitter taste of four parts of Epsom salts, a slight addition of the latter being plainly perceptible, although by no means so disagreeable as when tasted alone. Of an alcoholic extract of coffee, an amount representing twenty parts of coffee lost its bitter taste upon the addition of the glycyrrhizin. A number of other experiments of similar kind were made, but the author expresses his doubts about the *mathematical* reliability of results arrived at by taste alone, and confines, therefore, his remarks to the *modus operandi* of the glycyrrhizin.

Taste being an effect upon the nerves of sensation (of taste), the change of taste can be produced either by a chemical change of a substance, or by a peculiar local affection of the nerves of taste. The first case, as might have been anticipated, with Epsom salts, does not occur, the glycyrrhizin not affecting the sulphate of magnesia in any way.

The second supposition then assumes that the nerves are rendered insensible to the bitter taste. This may be done by an organic change of nerve matter, or the interposition of a foreign body between the nerves and the bitter substance. The latter explanation seems to give a true solution of the problem. When glycyrrhizin or liquorice dissolves upon the tongue, the latter soon becomes furred or coated; this coat being a coagulum of the albumen of the saliva with the glycyrrhizin. A few tests convinced the author that even a weak solution of albumen coagulates readily with glycyrrhizin, and he took the artificial coating of the nerves produced by the albuminous coagulum of glycyrrhizin to be the true

cause of its masking bitterness. If this was true, other substances, which readily coagulate albumen, should produce the same result.

With this idea he tried a solution of carbolic acid with various bitter substances, and in each case the bitterness was annihilated if the quantity of carbolic solution was sufficient. But while glycyrrhin and its compounds are sweet, this is not the case with carbolic acid, the taste of which replaced that of the bitter substance with which it was mixed, this taste being in itself not agreeable. To remedy this evil, carbolate of glycerin was tried with marked success. Epsom salts, coffee, absinthe, etc., lost their bitter taste when mixed with a sufficiency of carbolic glycerin.

Preparation of Collodion. Guichard. (*Journ. de Pharm.*, 4th series, xii. 290.) The author finds it extremely difficult to convert cotton wool into pyroxylin, which shall be perfectly soluble; he therefore recommends the use of white filtering paper which has been washed in dilute hydrochloric acid. The following is the process he adopts:—

Sulphuric acid, 1·82	1400 grm.
Nitric acid, 1·37	700 „
Paper cut in small squares	70 „

The paper is introduced into the mixed acids sheet by sheet, and allowed to remain about three hours at the ordinary temperature. To avoid any energetic action the vessel containing the ingredients should be surrounded by water. The paper is afterwards washed in a very large quantity of cold water and dried. It dissolves completely and immediately in the mixture of alcohol and ether, forming a collodion, which gives a homogeneous and contractile membrane.

The author considers that good collodion should always give a residue of 7·5 per cent. He recommends the use of medicated collodions as plasters, and gives the following formula for the preparation of a thapsia collodion, which may be employed as a substitute for the thapsia plaster of the French Code:—

Alcohol	3·5
Ether	11·5
Pyroxylin paper	1·0
Besin of Thapsia	10·0

This preparation is spread with a brush upon a piece of plaster at the moment it is wanted.

Xylonite. D. Spill. (*Pharm. Journ.*, 3rd series, i., 555.) The name “xylonite” is taken from the Greek word *xulon*, “wood;” and the material upon which this name has been bestowed is derived from woody fibre, cotton waste, flax, old rags, etc. These, after thorough

cleansing, are converted, by the action of nitric and sulphuric acids, into a rough form of xyloidine, and subsequently dissolved into a species of collodion. After drying and hardening, this forms a material admitting of many useful applications in the arts. The solvents employed for ordinary collodion are, of course, too expensive to admit of their use in this manufacture. Those employed are of two kinds, fixed and volatile. The fixed solvents are oil and camphor, such as linseed, castor oil, and other vegetable oils. The volatile solvents are wood spirit, mineral naphtha, etc. By suitable means the crude xyloidine is incorporated with these solvents into a smooth, homogeneous paste; and by varying the proportions of the ingredients, the condition of xylonite may be varied from the flexibility of morocco leather to the hardness of ivory or stone. It may be made into sheets suitable for the windows of a photographer's dark room, in which state it is flexible, durable, and light.

It may also be used for waterproofing, or it may be made into a substitute for ivory, bone, wood, marble, etc.

Detection of Acetone in the Methylated Spirit of Commerce. J. E. Reynolds. (*Proc. Roy. Soc.*, xix., 440.) In a paper "On a new group of Mercurial Colloids and certain fatty Ketones," by Dr. J. E. Reynolds, read before the Royal Society, April 24, 1871, the author writes as follows regarding the means of detecting methylated spirit:—

Since acetone is, according to my experience, invariably present in the wood-spirit of commerce, the reaction with mercuric oxide in presence of potassium hydrate, already described, becomes virtually a test for the presence of pyroxilic spirit in any mixture. The "methylated spirit" of commerce is such a mixture, and the acetone present in it can be detected with great facility in the following way:—Take 200 c.c. of the spirit, and rapidly distil off 50 c.c.; dilute the distillate with an equal volume of water, and slightly warm with addition of a few c.c. of solution of potassium hydrate. On cautious addition of mercuric chloride, the oxide first thrown down is speedily redissolved: excess of the mercuric salt must be carefully avoided. The alkaline liquid should be filtered clear, much of the alcohol allowed to evaporate slowly, and the residue then divided in two portions. One part is to be violently boiled for a few minutes: a yellowish-white gelatinous precipitate will suddenly make its appearance, if the acetone compound be present. In the second portion, dilute acetic acid, when added in slight excess, should produce a bulky, white, gelatinous precipitate,

when washed and completely dried, between 78 and 79 mercury.

in Distilling Ether. In the *Journal de Pharmacie*, 4th 7, M. Regnauld notices the following accident, whereby early lost his life. M. Adrian was working in his laboratory, when his assistant quitted, for a few minutes, where he was distilling ether by steam heat. Somewhat he had left M. Adrian observed that the flow of ether dried, and approached the still to moderate the force of fire, and held his hand on the key of the stop-cock, when all at the middle of the laboratory, he saw a flame, which directed towards the condensing vessel. The ether took fire and broke, and the contents burst over the still, which boiled over and inflamed ether over M. Adrian. During the confusion which ensued he tried to open a door situated near the laboratory but failed, and was constrained to traverse the flames and reach him in, to reach an open door beyond. During this time his clothing ignited, but his presence of mind served to lead him into a tub of water, which probably saved him from death. After a period of great suffering, during which his friends feared cerebral complications, he had recovered sufficiently to be able to give the foregoing account of the accident. M. Regnauld asks how an accident of this nature could occur in the hands of so prudent and skilful an operator as M. Adrian, so well acquainted with the properties and danger of ether? Was there no lamp in the laboratory and the heat was applied by a gas-burner? Probably the accident occurred by the current of ether passing over a neglected refrigeration, traversing the floor of the laboratory through the open door to some source of ignition, and then taking a path to the still. The density of ether vapour will support this theory, and the open door would naturally be the cause of the current in a heated room.

Preparation of Ferro-ethylene. J. Kachler. (*Zeitschr. f. Chem.* 1858.) On heating an ethereal solution of iron chloride in a glass tube for several hours to a temperature of 140° to 150°, the liquid changes its colour to greyish green, and contains many thin needles, whilst the sides of the glass tube are coated with a crust of the same substance. The same combination is obtained easier and better if to the ethereal solution of iron some phosphorus, dissolved in carbon bisulphide, is added. In this latter case, it is sufficient to heat the tubes merely in a water-bath for from six to eight hours. The liquid, which then has

turned to a light green colour, contains now a considerable quantity of colourless prisms, or flat longish plates. On opening the tab no gas is noticed to escape. The solution of iron chloride taken for the experiment contained 5 grammes in 50 grammes of ordinary ether. For each 10 c.c. of this solution 1 gramme of phosphorus in 3 c.c. of carbon bisulphide was added. The crystals were washed into a beaker, separated from the liquid by decantation, washed first with hot carbon bisulphide, then with perfectly anhydrous ether and dried between blotting paper and subsequent exposure to free air. They appear colourless, without lustre, brittle, and are easily soluble in water. The freshly-prepared aqueous solution shows all the reactions of protoxide of iron, and oxidises just as easily as iron protochloride. The crystals contain water, which they lose at 100° , whereby they turn yellow. Their constitution is expressed by the formula: $C_2 H_4 Fe_2 Cl_2 + 2 H_2 O$. If the ether employed in the reaction is completely anhydrous, no crystals are obtained. An attempt to substitute alcohol for ether gave a negative result.

Ethylate of Potassium: a new Caustic. B. W. Richardson (*Pharm. Journ.*, 3rd series, i., 362.) The ethylates are crystalline substances, in which one atom of hydrogen of absolute alcohol is substituted by one of potassium or of sodium. Brought into contact with the body, the ethylates at first produce no action, but as they pick up water from the tissues, they are decomposed, the potassium or sodium is oxidised, yielding caustic potassa or soda in the free state, while alcohol is reformed from the recombination of hydrogen derived from the water. Dr. Richardson proposes the employment of these ethylates as caustics. He believes they will be found to be the most effective and manageable of all caustics; and that in cases of cancer, when it is desirable to destroy structure without resorting to the knife, and in cases of nævus and other simple growths, they will be of essential service. The ethylates can be kept in solution with alcohol in various degrees of strength; the solution can be applied with a glass brush or injected by the needle, and a slow or quick effect can be insured, according to the wish of the operator. The ethylate of potassium is the most active agent.

Triethylic Ether. B. W. Richardson. (*Pharm. Journ.*, 3rd series, i., 362.) When the ethylate of sodium is acted upon by chloroform, the chemical action which takes place is very slow, and great care is required to secure a fair product. The chlorine of the chloroform combines with the sodium of the ethylate to form chloride of sodium, and triethylic ether remains. As the

reform contains three atoms of chlorine, each single part of chloroform decomposes three parts of ethylate of sodium. Thus:—
 $3(C, H_5, Na O)$, ethylate of sodium; $C H Cl_3$, chloroform = $3 Na Cl$, chloride of sodium, and $C_7 H_{16} O_3$, triethylic ether.

The ether is a heavy, aromatic, ethereal fluid, having a vapour density of 74, a specific gravity of .896, and a boiling point of $145^{\circ} C.$, $297^{\circ} F.$ It acts much like alcohol physiologically. Dr. Richardson has lately used it as a menstrum of ethylic ether for general anæsthesia. The ethylic ether carries over with it, in evaporation, sufficient of the heavier ether to form a compound vapour which is very pleasant to breathe and equable in action. He has administered this compound twice for operations on the eye,—once while Mr. Brudenel Carter operated for strabismus, and once while Mr. Walker, of Liverpool, operated for cataract. The anæsthesia in both cases was perfect. The ether also forms an excellent mixture with bichloride of methylene; and if mixtures of anæsthetic substances were satisfactory scientific applications, it might be brought into extensive use. Dr. Richardson accepts it, however, rather as an index of the way than of a resting-place. He looks for a simple ether which shall have the full and safe qualities of the mixture, together with perfect stability. There is, in truth, already another ether, called trimethylic, made by acting on methylate of sodium, $C H_3 Na O$, with chloroform: the product being $3 (Na Cl)$, common salt, and $C_4 H_{10} O_3$, trimethylic ether. But this ether, which has a vapour density of 53, and a high boiling-point, is not quite, though it approaches, the substance required.

Nitrite of Amyl. F. A. Bursell. (*New York Med. Gazette*, June, 1870.) Guthrie, who investigated the properties of the nitrite of amyl after the discovery of it by Balard, proposed it as a resuscitative in drowning, suffocation, and protracted fainting. It would seem worthy of a trial in the threatened syncope from chloroform; since the inhalation of but a few drops is followed by marked acceleration of the heart and flushing of the face. The writer poured about eight drops upon a towel, and, as an experiment, snuffed it two or three times, when immediately the radial pulse became accelerated, the heart throbbed with much force, and the pulsation of the cranial vessels became almost painful. At the same time there was a decided tingling of the ears. The symptoms lasted but a few moments; the tingling remained after the circulation had become quiet.

This agent has been used successfully in England by Dr. Brunton and Dr. Anstie for the purpose of alleviating the spasm of angina pectoris.

Nitrite of Amyl. B. W. Richardson. (*Pharm. Journ.*, 3^d series, i., 362.) Dr. Richardson, in the course of one of his lectures made the following observations on the action of this new medicinal agent:—

The physiological action of nitrite of amyl is directly exerted on the ganglionic nervous tract; it paralyses so that the nervous supply over the extreme vascular system is impaired; if the effect be sustained, the muscular system generally is thrown into relaxation. The observation of this effect of the nitrite has led Dr. Richardson to suggest it primarily as a remedy for excessive spasmodic action,—for tetanus specially,—and it has been applied in that direction with much success. Lately, Mr. Foster, of Huntingdon, has administered the nitrite with complete success in a case of traumatic tetanus,—holding the convulsions in check for the long period of nine days. The nitrite is best administered by inhalation, five minims on a piece of folded linen or handkerchief being the dose for an adult. It will act if given by the mouth; but as the action is very energetic, and requires to be kept under the control of the administrator, it is much safer administered by inhalation. In tetanus, the periods of recurrence of the spasmodic attacks should be carefully watched, and, when the paroxysm is threatened, the inhalation of the nitrite should commence, so as to subdue the spasmodic seizure. The agent has been administered also with success in spasmodic angina, asthma, and colic.

The action of the nitrite is curative only in so far as it controls the spasm,—that is to say, it prevents death, and so leaves time for recovery. Dr. Richardson has observed that frogs under strychnine tetanus are immediately relieved of spasm by nitrite of amyl, and that, with great care in keeping the animals free of spasm, they can be sustained until the strychnine is removed from the body, when there is recovery: in this explanation he defines the true place of the nitrite as a remedy. In tetanus, the administration of the nitrite is not to be considered as displacing other rational means of cure. On the contrary, it favours other means: it enables food to be freely supplied, it gives time for the action of purgatives and diuretics, and for the employment of the hot-air bath.

Nitrite of Amyl. C. Umney. (*Pharm. Journ.*, 3^d series, 422.) The author states that *true nitrite of amyl* should be made by passing nitrous acid into amylic alcohol, which has been previously subjected to fractional distillation until the portion retained for it has a boiling point of 132° C. A nitrite so prepared, when deprived of any excess of acid it may contain by rectification over fused

carbonate, will have a boiling point of 98°-99° C. The author has examined several specimens of this compound obtained in this manner, and has found them to be far from pure. This he attributes to their having been prepared from crude or merely rectified oil without any previous subjection to fractional distillation.

Is-Nitrous Ether (Nitrite of Amyl). J. M. Maisch. (*Amer. Pharm.*, xliii., 146.) The author considers the process of preparing this substance by passing nitrous acid into amylic alcohol, as unnecessarily complicated. According to Hunge, 5½ oz. of amylic alcohol require from eight to nine hours before becoming fully saturated with the nitrous acid; volatile products are evolved, and the residue contains nitrite and valerianate of amyl, a black non-volatile body, crystals of nitrate of ammonia, and amylic nitrate of amyl. He recommends the method first suggested by Hunge. It is advisable only to use rectified amylic alcohol which has been purified by Hirsch's method,* with solution of table salt and subsequent distillation with water.

Rectified amylic alcohol, with about an equal bulk of nitric acid, is introduced into a capacious glass retort, and a moderate heat is applied and very gradually increased. As soon as the mixture begins to boil, the fire is removed, and the reaction allowed to subside. If the application of the heat has been too rapid or too continued, considerable frothing occurs, and the contents of the retort apt to foam over. With a moderate and slowly increased heat the reaction is less violent and the temperature rises gradually after the removal of the fire and the beginning of boiling. As soon as the thermometer, inserted in the tubulus, rises above 100° C., the receiver is changed, the distillate now becoming more and more mixed with amylic ether and nitrate of amyl, readily perceived by its odour.

The distillate obtained below 100° C. is agitated with an aqueous solution of caustic or carbonate of potassa to remove free acid, and, after separation, the oily liquid is introduced into a clean receiver and again slowly heated. The first portion coming over is amylic aldehyde. When the very slowly increased heat has risen to 95° C. the receiver is again changed and the distillate collected as nitrite of amyl, until the thermometer reaches 100° C. when the distillation is stopped. It will be observed that the process for the preparation of this compound, consists of two operations; first, the production of the amylo-nitrous ether,

* *Amer. Journ. Pharm.*, 1862, pp. 139-328.

and secondly, its purification. In both operations the *very gradual* application and increase of heat is very essential. The amount of product obtained is small.

Redwood's process for nitrous-ether was tried for the production of this corresponding amyl compound, but the action was uncontrollable.

Nadler has recently given a process which consists in distilling amylo-sulphate of potash with nitrate of potash.

The Preparation of Chloral. E. R. Squibb. (*Proc. Amer. Pharm. Ass.*, 1870, 117.) In this paper the author gives the result of his practical experience in the manufacture of chloral. He writes as follows:—Chloral is the ultimate product of the action of chlorine on alcohol, as its name implies, the first syllables of the two words being formed into the name; "chlor," the first syllable of chlorine, and "al," the first syllable of alcohol, making "chloral." When chlorine gas in a dry state is passed into absolute alcohol, a series of changes appears to take place, which may depend on the abstraction of hydrogen and the substitution of chlorine. The first portions of chlorine gas that pass into absolute alcohol are converted, or appear to be converted, at once into hydrochloric acid, and that hydrochloric acid is absorbed by the remainder of the alcohol, and reacts with it, producing hydrochloric ether. The second step in the reaction is to again decompose or supersaturate this hydrochloric ether with chlorine, and then hydrochloric acid escapes; and finally, as heat is applied in the process, the hydrochloric ether escapes, and a substitution appears to take place, whereby chlorine is substituted for hydrogen in the already-decomposed alcohol. This is but a rude outline of the process. Chloral was discovered by Liebig in 1829 or 1830, although the paper in which it was described was not published until about 1832; therefore it is commonly stated that he discovered it in 1832, which is incorrect. Dumas was the next who investigated it, and these two observers investigated it as a table specimen product.

Last year Dr. Otto Liebreich, in his physiological investigations regarding the group of anæsthetic chemicals, reasoned back to this substance the known effects of chloroform, and tried it first upon animals, then upon patients. At first he supposed it was an anæsthetic, but afterwards modified this view, and now I believe regards it as a hypnotic, and in some cases, an anodyne. The apparatus for making chloral consists, first, in the means of generating chlorine; second, in the means of drying the chlorine; third, in the means of passing it into absolute alcohol in such a position that

can be gradually warmed. The process requires about seventy-eight days for the current of chlorine to be passed into the absolute alcohol, and I believe the slower the current passes into the absolute alcohol the better; that is to say, the longer the time which is taken to produce the chloral the better; I think there is less waste and more chloral obtained for the same quantity of alcohol. It is a curious circumstance that hydrate of chloral is produced by passing the chlorine into absolute alcohol, and this shows that water is one of the results of the decomposition of the alcohol; yet if hydrated alcohol be used, the product is different. I have tried different degrees of strength of alcohol, from absolute down to ninety-two per cent., and have obtained good results only from absolute alcohol. Sixteen gallons of such alcohol, in seventy-eight days, with the use of about a ton and a quarter of mixture of binocide of manganese and common salt, and about the same quantity of sulphuric acid,—the 16 gallons of absolute alcohol weighing about 92 pounds,—yielded about 160 pounds of crude hydrate of chloral. This crude hydrate of chloral, as it is made by the passage of the chlorine into the alcohol, is contaminated with several other products which pass over in the distillation, and cannot be separated by simple distillation. It is necessary, therefore, to apply sulphuric acid in the purification of the chloral. Concentrated sulphuric acid is shaken with the crude hydrate of chloral, and the dehydrated chloral is then distilled off from the sulphuric acid. In this way we get chloral that is free from water. After purifying this by one or two applications of sulphuric acid, then the stoichiometric proportion of water is added, and it is either sublimed or crystallised. In connection with this hydrature allow me to go back to the name of chloral—not hydrate of chloral, nor chloral hydrate. It seems to me surplusage, as we do not in our language commonly call hydrated compounds hydrates; that is, we do not usually recognise the presence of combined water in the names of chemical compounds. We do not say hydrate of sulphuric acid, or hydrate of hydrochloric acid, and in this case we shall save a good deal of nomenclature that is useless by calling it simply chloral. We heard yesterday, that the bees by taking a little honey from each flower gathered thirty millions of pounds. Every flower and every bee helps to make the aggregate. A certain amount of nervous force is expended on every word we utter, and if we save this word now (and now is the time to start), it will save an aggregate of nervous force which, in the future, will amount to a great many lives. I do not believe in useless language, particularly where it can so well be avoided, and, therefore, think we had better call

this from the beginning, simply chloral, although the other name is pretty generally used.*

The difficulties in the way of making chloral are very numerous. The apparatus I have now at work is about the tenth modification from the first one, and I started with all the knowledge on the subject then in the books. The liberation of chlorine from common salt and black oxide of manganese by running sulphuric acid into it is easy enough, but unless the current is steady the result is imperfect and there can be no good or definite calculations made as to the time or the quantity. The black oxide of manganese and common salt need both to be assayed and added together in their equivalent proportion, and then the calculated amount of sulphuric acid in any given specimen is to be made upon its specific gravity, and the acid can only be added to the mixture by calculation, because, if added until chlorine ceases to be eliminated a great excess will be used. I mix 100 pounds of the mixture of black oxide of manganese and common salt with about 10 gallons of water in a still, and then run seven gallons of 60° slowly into it, using "pan acid," 1.562 specific gravity, using a mechanical stirrer, and heating the mixture. In this a tolerably uniform current of chlorine is eliminated. This is then conducted to the drying apparatus, which consists of a three-neck Woulfe's bottle, with a long, narrow glass percolator ground into the middle neck. This percolator is filled with pieces of broken glass from which the fine particles have been sifted out, and into the top of this broken glass, concentrated sulphuric acid is supplied from an elevated reservoir. This acid percolates through the broken glass, and accumulates in the Woulfe's bottle below until it reaches the level of an adjusted siphon, by which it is discharged through one of the necks of the bottle. Through the third neck the chlorine enters by a tube which dips under the acid in the bottle. Thus the gas is made first to bubble through the acid in the bottle, and then to pass over the extended surface of broken glass in the tall percolator, this surface being kept moistened with fresh portions of acid, and thus becomes thoroughly dried and in the proper condition to enter the alcohol. The chlorine thus passed down into the alcohol at first increases the volume of the alcohol by one-fourth. At first the whole of the bubbles of gas are absorbed, and the alcohol increases in volume and becomes heated, the bottle requiring to be kept cold; but after about three days the reaction between the chlorine—

* While this note is being prepared for publication a serious mistake, by abbreviating the words hydrate of chloral to "hyd. chlor." in prescription, was corrected in time to avoid danger.—E. R. S.

alcohol becomes more sluggish, and then a little heat in the bath is necessary. From that time the bath is made gradually warmer till the end of the process, which is determined by the gas passing unchanged through the hot liquid in the bottles.* The product is the crude hydrate of chloral. Then if the contents of the bottles be allowed to cool, a large proportion crystallises. It will not run from one part of the bottle to another, but still is very moist. It is taken in portions of about twenty pounds at a time, and then mixed up with six to eight pounds of strong sulphuric acid, the whole mixture poured into a tubulated retort and the chloral distilled.

This is received in a clean, dry vessel, is weighed, and then partially hydrated with a weighed quantity of water. Carbonate of lime and slaked lime are then added in the proportion of four ounces to each twenty pounds, and the mixture is again distilled from a retort apparatus. The result of the distillation now is partially hydrated chloral; it distils better partially hydrated than when hydrated directly. The remainder of the water required by stoichiometrical calculation is now added, and the hot liquid poured on plates to crystallise, the plates being covered by a bell-glass. In a few hours the crystallisation is complete, and if well managed the contents of the vessels are in a solid cake, which is rubbed into a coarse, damp powder in a clean mortar, and filled into bottles.

I have obtained from 16 gallons of absolute alcohol 160 pounds of crude chloral, which, when purified, yielded about 125 pounds of purified hydrate of chloral. That is about the best yield I have yet obtained. I have now about 65 gallons in process all the time, by a series of distillations, by which I expect to get 140 pounds, or thereabouts, every week, or every ten days; that is, each bath being of a different age, and being finished in about thirty days, will give one bath or process every ten days. It will thus be seen that it is not a very profitable preparation to make, particularly when made in competition with the foreign article, and I believe I should never have undertaken to make it, except for my conviction that it is the most important of all additions to the materia medica for many years past, and very commonly sent to our market from abroad of bad quality, and without any traceable responsibility in regard to quality or make.

Some accidents of apparently trivial nature seemed to indicate that chloral is very liable to decomposition from contact with organic matter, but experiments have shown that it is not equally liable to decomposition from all kinds of organic matter. Even the same kind of organic matter does not always produce the same effect with the same chloral. For example, where syrup of orange-peel is used

as a vehicle, decomposition, with the production of hydrochloric acid, will sometimes commence in a day or two, and sometimes not for weeks, though the apparent conditions be the same. One observer will testify that with simple syrup it never spoils or decomposes while another, equally trustworthy, will find the same chloral decompose with simple syrup very promptly. Under such circumstances the only safe practice is to keep chloral as free as possible from all organic matter until we know more about it; and this particularly in view of the harm it does when given in even a partially decomposed solution. It appears to be by far the best practice to dispense it in simple watery solution in glass-stopped vials, since in this condition it keeps indefinitely, and can be added to any desired vehicle at the time of taking, and ice-water appears to be about as good a vehicle for this, as for all saline substances, as any yet devised. When given to patients who have been long fasting it is often found to disagree with them, or at best to affect them less favourably than when given near a meal, or when the gastric secretions are not in the condition of long fasting. Hence, the syrup of orange-peel, or the mucilage etc., with which it is common to give it, may not be without useful effect, and those physicians who have now abandoned these mixtures for the simple solution, often, if not generally, advise their patients to eat a cracker, or take some other light food in small quantity, before or immediately after a hypnotic dose. When the medicine affects persons unfavourably, it should always be examined for hydrochloric acid by smelling and tasting, and by litmus paper. Nitrate of silver is too sensitive a test, for if the solution have been some time made and especially when water containing organic matter is used, cloudiness may be produced with this test which it is quite safe to disregard.

Preparation of Chloral. (*Pharm. Zeit.*, 1871, No. 11.) Spring mühl proposes, in *Polytechn. Notizbl.*, to shorten the long process by the addition of 1 grm. iodine to 500 grm. absolute alcohol after passing chlorine through the liquid for twelve hours, the free acid is neutralised by lime, the warm liquid filtered and distilled. Ethyl-iodide distils over at 72° C., and between 110° and 115° C. the chloral, which is treated in the usual way with sulphuric acid, redistillation, etc.

Purification of Chloral Hydrate. Dr. F. A. Flückiger. (*Neu. Jahrb. f. Pharm.*, 1870, 200.) The author refers to Rieckher's and Hager's observations, regarding reliable tests for the purity of this medicinal agent, but he objects to its employment unless it be in well formed separate crystals. Though as met with in commerc

is usually of good quality, the crystalline masses or imperfect fragments of crystals are unsightly in appearance, frequently possess a stinging odour, and readily absorb moisture; qualities which are due to its insufficient purification on a large scale. The last traces of impurity cannot be removed by fusing and redistilling it, and its appearance is not improved by this operation. This purpose is effected solely by recrystallisation.

There is perhaps scarcely a liquid in which chloral hydrate is insoluble at ordinary temperature; four parts of it dissolve gradually in one part of water, the solution crystallises at 0°C ., but not in well formed crystals. Alcohol and ether dissolve it to such an extent that it likewise does not crystallise well on evaporating these solvents; absolute alcohol must be excluded because it combines with chloral.

Chloroform and benzole are well adapted for recrystallisation, but the first is too dear, and the last cannot be entirely removed from the crystals. The same holds good for oil of turpentine, from which most beautiful tables and laminæ are obtained, if one part chloral hydrate is dissolved in from five to six parts of the oil, at from 30° to 40°C ., and the solution allowed to cool slowly. Fat oils, which dissolve it readily are evidently not adapted for this purpose. From petroleum ether, which at a moderate heat dissolves much chloral hydrate, it crystallises well on cooling, but too rapidly to admit of large prisms being obtained; on a large scale, however, it may be of better service.

Uniformly satisfactory results were obtained with bisulphide of carbon. 45 parts of it dissolve at 15° to 18°C ., but 1 part chloral hydrate; it precipitates ethereal and alcoholic solutions of the latter. But at a temperature near the boiling point of bisulphide of carbon, 4 to 5 parts of it are sufficient for dissolving 1 part chloral hydrate. If allowed to cool slowly, beautiful crystals, often an inch in length, are obtained, easily collected, and readily freed from the last traces of the solvent by exposing them in thin layers to the air. Thus obtained, chloral hydrate possesses no acid reaction, and does not attract moisture. The best prisms begin to fuse at 49°C ., larger quantities at 53° to 54°C ., the fused mass congealing again at 34° , or at 40°C if a few crystals had remained unfused. Samples not well crystallised fuse at a lower temperature. The boiling point is 97.5°C if the entire thermometer is surrounded by the vapours.

Bisulphide of carbon is cheap. Some loss is unavoidable; impurities in the mother-liquor increase gradually to such an extent

that a rectification of the bisulphide over corrosive sublim becomes necessary. With the last portions of the solvent a little chloral hydrate evaporates from the crystals, but the loss from that source is insignificant, half a grain having lost but 3·3 per cent in nine days. A draught of cold air, the addition of some petroleum ether, and the employment of the centrifugal machine will be of service when operating on a large scale. The price of chloral hydrate ought not to be raised in consequence of such purification.

Test for Hydrate of Chloral. C. Umney. (*Pharm. Journ.*, 3rd ser. i., 107.) The following is the process which was recommended by Mr. Umney for testing chloral hydrate, and has been known as "the ammonia test":—

Take 500 grains of the salt, and dissolve it in about an ounce of distilled water; transfer to a 1000 grain graduated tube, make up the measure of the solution to 700 grain measures, then add solution of caustic ammonia (891) until the whole measures 1000 grain measures. Agitate; immerse the tube in warm water to assist the reaction, and set aside for twelve hours. Upon examination the fluid will be found to have perfectly separated into two layers, the lower being chloroform (from fine specimens of hydrate nearly colourless), the upper a deep sherry-coloured solution of formiate of ammonia.

The volume of the chloroform layer should not be less than 235 grain measures, which, calculated at the specific gravity of chloroform (1·497) would give 351·7 grains by weight, a quantity equal to about 70 per cent. (73·3) of the chloral compound employed.

Alcoholate of chloral tested in the same way will yield about 60 grain measures of chloroform, or 299 grains by weight, equivalent to 60 per cent. (59·8) of the chloral alcoholate.

The author considers that the difference in the boiling point of the hydrate (95° Cent.) and of the alcoholate (116° Cent.) is almost sufficient to distinguish one from the other.

In reference to the foregoing process, Dr. Paul writes (*Pharm. Journ.*, i., 662) as follows:—

"I may remark that care must be taken to ensure completion of the reaction before reading off the volume of chloroform. In the course of the reaction the temperature to which the tubes have to be heated must be regulated by the nature of the product. A temperature of 100° maintained for three or four hours is quite enough. Meanwhile the tubes should be well shaken. If these precautions be observed, probably very little chloroform may be produced, and it may happen that the chloroform-layer appears to be much less

than it ought to be. In such cases it will be found that after some hours' rest, crystals separate from the chloroform. This latter circumstance is due to incomplete decomposition of the chloral hydrate and its solution in the chloroform, produced apparently with increase of volume. On heating a tube in this condition, the recommencement of the reaction will be at once apparent, and after cooling the chloroform layer will be found reduced to its true volume.

Test for Chloral Hydrate. C. H. Wood. (*Pharm. Journ.*, 3rd series, i, 703.) The author writes as follows:—

Having had occasion during the last few months to examine a number of samples of chloral hydrate, I have made a great many trials of the ammonia test described by Mr. Umney. This method possesses the apparent advantage of simplicity; but, to ensure accuracy, several precautions which are somewhat tedious must be carefully observed. Dr. Paul, in the paper recently published by him, has shown that, unless the mixture be warmed for a considerable time and frequently shaken, a result either too high or too low may be obtained. That exactly confirms my own experience. Moreover, the large quantity of material required for each operation, and the length of time (about 12 hours) which must elapse before the results are obtained, constitute considerable inconveniences. I have therefore had recourse to another method for determining the yield of chloroform, which appears to me to possess several advantages. A hundred grains of the chloral hydrate to be tested are introduced into a 4-oz. flask and dissolved in an ounce of water. Thirty grains of dry hydrate of lime are then added, and a cork, furnished with a long piece of glass tube, is fitted to the mouth of the flask. This tube is bent over just above the cork, so as to slant down and form a condenser. It is surrounded with wet blotting-paper during the experiment. The extremity of the tube is somewhat drawn out, so as to enter a graduated tube, which serves as a receiver. A gentle heat is then applied to the flask, and the chloroform slowly distilled over. After a few minutes the heat is increased, so as to keep the mixture boiling, and continued until about 100 grain measures have been collected in the receiver. By this means the steam thoroughly displaces and sweeps over the last traces of chloroform. It is only necessary to read off the volume of chloroform obtained. Before taking the final reading, it is advisable to keep the tube in a vessel of water exactly at 60° F. A few drops of liq. potassæ poured into the tube destroys the meniscus of the chloroform, and enables the operator to read off very accurately. The whole process does not

occupy more than a quarter of an hour; and, as far as my experience goes, the results obtained are very trustworthy. If a larger quantity of lime be employed than the amount indicated, some inconvenience is experienced from the frothing of the mixture, but this is easily avoided. Milk of lime appears to exercise no sensible action on chloroform. I have made several experiments in which known volumes of chloroform have been taken in the place of the chloral hydrate, and in every case I have obtained the proper amount back within about a single grain measure. The tube which I employ as a receiver was carefully graduated for the purpose. It is about ten inches long and a quarter of an inch internal diameter. It was graduated by introducing a few drops of liq. potassæ, and then running in pure chloroform at 60° from an accurate burette, marking the tube with a file after every addition of ten grains measurement. Five such marks are all that is required. The space between the fourth and fifth mark may easily be divided afterwards into ten equal parts.

For the recognition of alcoholate in chloral hydrate I have always employed Lieben's test for alcohol, which answers the purpose easily and satisfactorily. It is best applied to the aqueous portion of the distillate accompanying the chloroform. If this supernatant layer be decanted into a test-tube and warmed with 2 or 3 grains of iodine and a slight excess of liq. potassæ, a crystalline precipitate of iodoform will gradually form when only minute traces of spirit be present.

As far as my experience goes, the alcoholate is not, if it ever has been, an article of commerce.

For several reasons it is desirable to take the yield of chloroform as a criterion of the quality of chloral; nevertheless it does not appear to me necessary to resort to this quantitative reaction in the ordinary examination of trade samples.

The following simple tests, which are quickly and easily performed, constitute a sufficient guarantee of the purity of commercial chloral hydrate:—

1. A small portion heated on platinum foil should entirely volatilize without leaving any visible residue.

2. Twenty grains dissolved in a drachm of distilled water should form a perfectly bright and clear liquid. A drop of nitrate of silver solution added should produce no turbidity.

3. A drachm introduced into a test-tube furnished with a cork through which passes a thermometer and a small outlet tube, should boil, on the application of heat, without the temperature rising above 212° F.

The boiling point is a very important character of chloral hydrate, and should never be neglected, even when the chloroform test is also employed. It will at once distinguish between the hydrate and alcoholate.

Chloral Hydrate and Chloral Alcoholate. Dr. F. Versmann. *Pharm. Journ.*, 3rd series i., 701.) The author writes as follows, regarding the physical properties of these two substances:—

Dr. Paul, in his article in this journal of 4th ult., has drawn attention to the difference in the crystalline forms in which the hydrate is sold; this is, no doubt, owing to the different solvents employed for recrystallisation. Thus, a concentrated aqueous solution, placed under the air-pump, gives rhomboid crystals; ether gives small hard crystals; acetone, fine needles; warm benzole supersaturated also deposits on cooling fine needles; whereas a solution in benzole, allowed gradually to evaporate, deposits large crystals sometimes $\frac{1}{2}$ -inch long. Bisulphide of carbon, in same manner, yields either fine needles or large crystals. A saturated alcoholic solution gives beautiful long feathery crystals. I obtained some $1\frac{1}{2}$ in. long, which have all the appearance of the alcoholate, and which were found to be so. This is remarkable, and may possibly account for the fact of one sample, obtained as hydrate, being pure alcoholate, as the manufacturer may have recrystallised the impure hydrate from alcohol without being aware of the change produced.

The hydrate is extremely soluble in water, 100 parts of water dissolve as much as 360 parts of dry crystals; the alcoholate is also soluble in water, but to a much smaller extent, and much slower.

In fact, the two may be readily distinguished in the following manner:—Take a pretty wide beaker-glass, 6 or 8 in. high, full of water; drop a few crystals into it; the hydrate sinks down at once, and is almost dissolved before it reaches the bottom. With the alcoholate the larger crystals only will sink to the bottom, and lie there for several minutes before they gradually and very slowly disappear; but small crystals or fragments of crystals will float on the surface of the water, and as soon as they are attacked by the water, the slight current of the saline solution sinking down occasions sufficient disturbance to apparently impart life to the solid articles: they begin to spin round and round, and dart from one side of the beaker to the other, until the very last solid particle has disappeared. This is not only a very pretty and amusing sight, but is really a distinctive mark between the hydrate and the alcoholate. Slightly tepid water makes the action even more violent.

The specific gravities of solutions in water of the two compounds also show a great difference, as will be seen by the following figures :—

Temp. 15·5° C. (60° F.)				Hydrate.	Alcoholate.
20 per cent. solution	.	.	.	1085	1071
15 "	"	.	.	1062	1050
10 "	"	.	.	1040	1028
5 "	"	.	.	1019	1007

The specific gravity of the two substances in the liquid state is another criterion: that of the hydrate being 1610 at 49° C. (120° F.), and of the alcoholate 1143 at 40° C. (104° F.).

I do not attach any value to the boiling-point as a test for purity, and for this reason: both hydrate and alcoholate at that temperature begin to decompose into chloral and water or alcohol respectively, and it is sometimes extremely difficult to take correct observations. I have had undoubtedly good samples of hydrate commencing to boil only above 100° C., and of alcoholate commencing to boil at 80° C.

Finding the ammonia test to be open to some objection, Dr. Versmann recommends the following method of testing, which is based on the separation of liquid chloral from the compound:—

I take about equal parts by weight, *i.e.*, 10 grammes of the hydrate, and from 5 to 6 c.c. of sulphuric acid: the quantity of the acid is of no consequence within certain limits; 5 parts of hydrate and one part of acid do not separate chloral, even when heated. And again a great excess of acid, such as 5 parts of acid and 1 of hydrate does not give a satisfactory result; neither the chloral nor the acid becomes clear, perhaps because of the formation of chloralide.

But as the result of a series of experiments, I find that about equal proportions by weight are very satisfactory. The acid, after combination with the water of the hydrate, and the resulting chloral are not so widely different in their specific gravities as to immediately separate. I therefore prefer to warm the mixture to expedite the separation.

In a graduated tube, provided with a well-ground glass stopper, and graduated into 0·1 c.c.; I introduce from 5 to 6 c.c. of sulphuric acid, and heat it by placing the tube into a vessel of water of about 60° C. (140° F.); I then add 10 grammes of chloral hydrate, shake well, so as to cover all the hydrate with the acid, and put the tube back into the hot water. The decomposition is instantaneous,

and the two liquids separate very distinctly; the chloral, floating at the top, may be read off as soon as the tube has cooled down to the operating temperature. After an hour or so the two liquids begin to mix again, and in about twelve hours the chloral is changed into perchloral, a substance of exactly the same chemical composition as chloral, but solid and absolutely insoluble in water and alcohol.

I find the previous heating of the acid most convenient, because, just as in the combination of chloral and water very considerable heat is evolved, so in the taking away of the water by sulphuric acid an immense amount of heat is absorbed, and the cold produced is so considerable as to seriously interfere with the separation of the chloral. Determinations with numerous samples, both with the ammonia test and the sulphuric acid test, always gave a somewhat different result with the last, which is more correct.

For this reason, and also because the whole operation may be completed in a few minutes, I prefer it to the ammonia test. In a subsequent paper I intend publishing the corresponding results of the two methods.

Detection of Alcohol in Chloroform and Chloral Hydrate. Hager. (*Pharm. Centr., and Pharm. Journ.*, i., 683.) A. Lieben, in the *Zeits. der Chem. und Pharm.*, 1870, *Suppl.* bd. viii., 2, describes a method of detecting ethyl alcohol by the formation of iodoform. In the simple case when the presence of alcohol in a watery solution is to be determined, the sample is warmed in a test-tube, a few drops of an iodinated potassium iodide solution are added, and afterwards a few drops of potassium hydrate solution. If the quantity of alcohol is not too small, a turbidity results by the formation of microscopically small yellow crystals of iodoform.

Hager finds this reaction very accurate, and states that it detects alcohol in liquids containing but $\frac{1}{2000}$ after about one day's standing. The crystals are remarkable and beautiful by the variety of their re-shaped arrangement. Hager suggests the following *modus operandi*:—The reagents used are solution of potassium iodide in 5 times its weight of distilled water, and over-saturated with free iodine; 2, a solution of potassium hydrate of about 10 per cent. strength. To the liquid to be examined 5–6 drops of the latter solution are added. After warming to about 50° C., so much of the potassium iodide solution is added drop by drop that its colour, after gentle agitation, remains yellowish-brown; then the liquid is fully discoloured by the addition of a few drops of the potassium hydrate solution. When set aside the iodoform crystals deposit, and are recognised under the microscope.

The process is obvious: it is effected not alone by ethyl alcohol, but by a number of different substances, among which are aldehyde, acetone, gum, sugar, lactic acid, methyl alcohol, propyl alcohol, and many volatile oils. The formation of iodoform does *not* take place with amyl alcohol, ether, ethyl chloride, chloroform, chloral hydrate, glycerin, phenol, and by acetic, benzoic, butyric, citric, formic, oxalic, succinic, valerianic, and tartaric acids.

The following test is, according to Hager, superior to any for the detection of alcohol in chloroform and chloral hydrate:—

Chloroform.—To determine the presence of alcohol in chloroform, 2 vols. chloroform are mixed with 5 to 10 vols. of water, of about 50° C. The liquid, after some shaking, is poured on a filter previously completely saturated with water. The filtrate is then examined as described above. After twelve to twenty-four hours' depositing, the sediment is examined under the microscope.

Chloral Hydrate.—Chloral forms with ethyl alcohol chloral alcoholate, corresponding to chloral hydrate in its chemical and physiological properties. Since the equivalent weight of ethyl alcohol is five times greater than that of water, it is of considerable pecuniary advantage to the manufacturer to bring the chloral alcoholate into the market instead of the hydrate; besides, the former crystallises finer and more solid.

The examination is made with a solution of the sample in distilled water, in the above given mode. When discolouring the iodinated liquid, each drop of the potassium hydrate solution produces turbidity, which, however, disappears on gentle agitation. If the sample contains alcoholate, the liquid remains more or less turbid, or deposits iodoform crystals after a time, although this is partly soluble in the presence of chloral. Of some commercial samples examined by Hager, Schering's chloral hydrate was the only one entirely free from alcoholate.

More recently Schering calls attention to some more distinctions between chloral hydrate and chloral alcoholate; when warmed in a test-tube in twice their bulk of water, the hydrate, as is known, dissolves readily, but the alcoholate melts without solution, and on cooling congeals under the water. Sulphuric acid, when warmed with chloral hydrate, remains colourless, whilst it turns brown with the alcoholate. When warmed in nitric acid of 1·2 sp. gr., chloral hydrate gives none or but a very slight reaction, whilst with the alcoholate a vehement reaction ensues under evolution of nitrous oxide gas.

Chloral Hydrate: its Use. Dr. Richardson. (*Pharm. Journ.*

, i., 650.) In a recent lecture, Dr. Richardson made some remarks on the recent fatal, or assumed fatal, cases from the use of the hydrate of chloral, and discussed certain important questions relating to the action and the effects of chloral, on which he had been consulted by members of the medical profession. To ascertain whether the practice of taking the hydrate without advice or direction was becoming at all general amongst the public, he gave a direct affirmative answer. He held that, in all hands, now that its action is better understood and the effect of its application has worn off, the employment of the hydrate is less than it was some months ago; while the practice of giving it to it by the public is on the increase, and a new class of cases is hereby becoming known, marked by particular symptoms, and, in some instances, a serious character. Regarding the extent to which the hydrate is now employed, Dr. Richardson said he had been able to estimate that nearly 500 grains of the agent had been used in England in the last eighteen

months. On the question, what is a dangerous and what a fatal dose of the hydrate, the lecturer computed that 120 grains was a dangerous dose, and 180 grains a fatal dose. He cited a case of recovery from a dose of 180 grains, but the symptoms were very prolonged and the risk

of the question related to the quantity of the hydrate that could be given in small and repeated doses during a limited time, twenty-four hours. The answer to this was, that an adult could not decompose and eliminate more than from 5 to 7 grains of the hydrate per hour, and that it was therefore not prudent to administer more than 120 grains in the time suggested, viz., twenty-four hours. On a fourth question, whether the frequent administration of hydrate of chloral lessened or increased the danger of administration, the argument ran to the effect that the frequent administration, while it might increase the confidence of the patient who took the drug, in respect to its safety, actually increased the danger. To use a technical phrase, there was danger in the repetition of "accumulation," while the power of the hydrate to dispose of the agent by diffusion, decomposition, and excretion, became sensibly reduced. A striking contrast was marked between the actions of opium and hydrate of chloral, by which it was shown that the latter cannot, like the former, be administered in increased, except in the most limited degree, without danger. Three other questions were noticed at length,

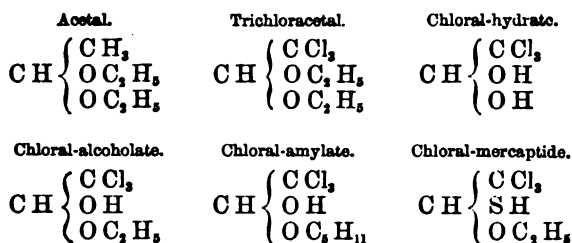
having reference to the symptoms and pathological conditions incident to the prolonged use of the hydrate, the chemical tests for it in the tissues in cases of poisoning by it, and the *post-mortem* appearances in cases where it proved fatal after administration in many successive doses. These points, which excited much interest in an audience composed almost exclusively of medical men, are of less moment to our own readers than the subjects we have briefly noticed above.

It will be recollected that Dr. Richardson was the first physician in England who experimented and reported on the action of chloral hydrate after Liebreich's discovery of its properties, his report having been prepared at the request of the biological section of the British Association for the Advancement of Science, and read at the annual meeting of the association at Exeter, in 1869.

Chloral. C. A. Martius and P. Mendelsohn Bartholdy (*Buchner's Repertorium für Pharmacie*, xix., 357.) In the course of our experiments on the preparation of hydrate of chloral, it fell in our way to examine different preparations found in commerce the purity of which was guaranteed by crystallisation from sulphuret of carbon and ether, and subsequent pressing out. Our attention was also directed to the varying statements respecting the points of fusion and ebullition of hydrate of chloral, and to the possibility of admixture of foreign substances, even after the removal of free chlorine and hydrochloric acid, and notwithstanding its solubility and apparent homogeneity; and that to these foreign substances might be due the discrepancies relative to physical properties, and possibly also the physiological discrepancies found by different observers. We were specially struck by the differences in boiling point in different preparations, and led to the preparation of a series of compounds which threw light upon these discrepancies and which are, moreover, of some scientific interest.

It had been observed by J. Personne that chloral enters into combination with alcohol just as it does with water. According to our observations, the other alcohols of the fatty series behave similarly to ethylic alcohol. When one equivalent of chloral is mixed with one equivalent of anhydrous ethylic alcohol, there is union accompanied with development of heat, and, on cooling, the resulting compound solidifies into a crystalline mass. The same takes place when methylic, butylic, or amylic alcohol, or mercaptan, is substituted for ethylic alcohol.

We may regard these compounds as intermediate trichloroacetal



Inasmuch as the production of these compounds takes place without formation of any bye-products, analysis of them appeared to be unnecessary. The authors have, however, taken the vapour-densities of some of them, and found that, like chloral-hydrate itself, they have only half the condensation indicated by their formulæ.

With the *ethers* of the alcohol-radicals chloral does not combine. The compound of chloral and ethylic alcohol boils at 115° to 116° C., and solidifies at 40° C., becoming crystalline. At 40° C. (in the fluid condition) its sp. gr. is 1.143.

In cold water it dissolves only slowly, but on warming, the solution is complete. In ether, alcohol, acetic ether, and petroleum, it is easily soluble; and on cooling the hot concentrated solution, it crystallises out in long beautiful needles.

The methylic compound resembles the ethylic compound very closely. It boils at 98° C.

The amylic compound boils at 143° C., and at 25° C. has a sp. gr. of 1.234. At 25° C. it solidifies to a crystalline mass, which is soluble in ether, alcohol, and petroleum. From the last-named solvent it is capable of crystallising in long tufts of needles. Only on prolonged boiling with water is the decomposition into chloral and amylic alcohol complete.

Chloral-mercaptide, chloral, and mercaptan combine with great evolution of heat, and form a crystalline compound, soluble in ether, alcohol, sulphuret of carbon, and capable of crystallising easily out of its solutions in these solvents.

It can easily be understood that the alcohol compound has been often taken for the hydrate of chloral, and that the hydrate has been often contaminated with the alcoholate.

It appears to be especially interesting to study the physiological characters of the alcohol-compounds. According to O. Liebreich, the physiological effects of the alcoholate differ essentially from those of hydrate. In preparing the hydrate for medicinal use, one of the main points to be attended to is its freedom from alcoholic

compounds. Pure hydrate of chloral boils at 95°C ., as the authors have ascertained by numerous experiments.

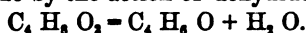
On the Action of Chlorine on Aldehyde. G. Kraemer and A. Pinner. (*Ann. der Chim. u. Pharm.*, clviii., 37, and *Journ. Chem. Soc.*, ix., 556, 1871.)

In this communication, the authors describe at length their experiments on the action of chlorine on aldehyde, undertaken chiefly in the hope of thus obtaining chloral, and being able to utilise the valueless residue from the first runnings obtained in the distillation of crude spirit, which consist mainly of alcohol, aldehyde, and paraldehyde.

Chlorine was passed into aldehyde, at first carefully cooled in a freezing mixture, and only heated to 100° at the close of the reaction. The first few bubbles caused the separation of a small quantity of solid metaldehyde, whether originally present in the aldehyde or formed by the reaction, is undecided. After a short time, evolution of hydrochloric acid set in, and every trace of chlorine was absorbed. With 100 grms. of aldehyde, at the end of 24 hours no further absorption took place, even at 100° . The resulting brown mass consists of two layers: a lower, darker, almost solid, and an upper, lighter coloured, liquid layer. The latter is a saturated solution of hydrochloric acid and the bodies of the lower layer in water. As it was found impossible to separate these two well, the whole was submitted to distillation. A considerable quantity passed over between 90° and 100° ; the thermometer then rose rapidly to 160° ; and the main product distilled over between this and 180° ; the temperature again rose to about 240° , but only decomposition-products were obtained, and a considerable carbonaceous residue remained in the flask. The authors did not succeed in any case in detecting acetic acid, acetyl chloride, or the body $\text{C}_4\text{H}_7\text{ClO}_2$. The simplest and quickest method of purifying the portion boiling at 160° – 180° was found to be fractional distillation. By this means a body boiling at 163° – 165° was isolated, which proved to be *crotonic chloral*.

Trichlorcrotonic Aldehyde, or crotonic chloral, $\text{C}_4\text{H}_3\text{Cl}_3\text{O}$. This is a colourless oil of peculiar odour, somewhat recalling that of ordinary chloral; it combines with water to a crystalline hydrate; the reaction being attended by a considerable rise of temperature on mixing it with alcohol, much heat is evolved, but no crystalline compound is formed. It is readily decomposed by alkalis; fuming nitric acid converts it into the corresponding trichlorinated acid. In short, in chemical behaviour it corresponds in every respect with the trichloraldehyde of the acetic series. Its formation is easily

explained, since Kekulé has shown that aldehyde is readily converted into crotonic aldehyde by the action of dehydrating agents :



Now gaseous hydrochloric acid is one of the most effective agents of condensation, and by the first action of chlorine on aldehyde, hydrochloric acid is formed ; and this reacting on the aldehyde, effects its conversion into crotonic aldehyde, which then becomes gradually chlorinated.

Crotonic Chloral hydrate, $C_4H_5Cl_2O \cdot H_2O$. May be readily re-crystallised from water, forming thin, dazzling white, shining plates, which pertinaciously retain water, and melt at 78° . It is very volatile in a current of steam. It is difficultly soluble in cold, readily in hot water, very soluble in alcohol. Its vapour powerfully attacks the mucous membrane and the eyes.

Dichlorallylene, $C_4H_4Cl_2$. The decomposition of ordinary chloral by alkalis into chloroform and formic acid, rendered it probable that crotonic chloral would yield allylic chloroform and formic acid.

In fact, such a body does seem to be formed in the first instance ; but it is immediately decomposed, with separation of hydrochloric acid.

Even the body thus formed is of no great stability ; when perfectly dry, it soon loses its pleasant odour, gives off hydrochloric acid, and smells of phosgene. It boils at 78° .

On heating, crotonic chloral hydrate seems to split up into water, carbonic oxide, hydrochloric acid, and dichlorallylene.

In a subsequent paper (*Deut. Chem. Ges. Ber.*, iv., 256) one of the authors, A. Pinner, describes a further experiment on the action of chlorine on aldehyd, in which he sought to remove the hydrochloric acid as fast as it was formed, and thereby prevent the conversion of the aldehyd into crotonic aldehyd by the dehydrating action of the anhydrous hydrochloric acid, as explained above. He added fragments of marble to moist aldehyd, and passed a slow stream of chlorine over it. In consequence of the presence of water, most of the aldehyd was oxidised ; nevertheless, he succeeded in obtaining about 15 to 20 grains of impure chloral. When the aldehyd was dry, the marble did not react with the acid formed.

Conversion of Chloral into Aldehyd by Inverse Substitution. J. Personne. (*Ann. C. Pharm.*, clvii., 113, and *Journ. Chem. Soc.*, ix., 134, 1871.) The author obtained aldehyde by adding zinc to a solution of chloral hydrate, acidulated with hydrochloric or sulphuric acid. In an experiment, in which the action was moderated by adding the acid gradually, and in small quantities only, to the zinc and chloral, suffi-

cient aldehyd was obtained to prepare the ammonia compound, and render its identity certain. At the same time, polymers of aldehyd are formed, in particular paraldehyd.

By passing ammonia gas into a well cooled vessel, containing small quantities of anhydrous chloral, trichloraldehyde-ammonia, $C_2HCl_3O.NH_3$ is obtained, very similar in its properties to aldehyde-ammonia. When ammonia is passed not so slowly into quantities of chloral greater than two or three grms., the liquid, even when well cooled, becomes heated; and besides the trichloraldehyde-ammonia, chloroform and formamide, CH_3NO , are produced, owing to secondary reaction, thus: $C_2HCl_3O + NH_3 = CHCl_3 + CH_3NO$.

Bromal, and the By-Products obtained in its Preparation. Dr. S. Schäffer. (*Berichte der Deutschen Chem. Gesellschaft zu Berlin*, No. 7, 1871.) The author, while preparing hydrate of bromal on the large scale, by causing the vapours of bromine to pass into alcohol, care being taken to avoid an excess of the haloid, and thereby preventing the formation of bromated bromethyls, studied the substances resulting from this reaction by first submitting the raw product to distillation in a steam-bath, and next employing a sand-bath. By the steam-bath heat some bromide of ethyl, acetic ether, and solution of hydrobromic acid were driven off; while by further heating, three different groups of bodies were obtained, viz.:—At from 100° to 130° , chiefly hydrated bromhydric acid; at from 165° to 180° , bromal and an oily substance insoluble in water; above 180° , some substance boiling with partial decomposition. From the distillate, which came over at between 165° and 180° , bromal was separated by the admixture of water, and the hydrate of bromal obtained in a pure state by recrystallisation. Bromal boils, without decomposition, at 173° , and is not congealed at 20° . The hydrate of bromal fuses at 53.5 , and can be distilled without decomposition, being converted into water and bromal, which latter, on being mixed with perfectly absolute alcohol, yields a bromal-alcoholate, a solid crystalline body, fusing at 44° , difficultly soluble in water, but readily so in alcohol and ether; on being submitted to distillation, it is converted into alcohol and bromal. The formula of this alcoholate of bromal is $C_2Br_2OHC + C_2H_5O$.

Hydrate of Bromal. E. Steinauer. (*Journ. de Pharm. d'Anvers*, 1871, 105.) The author prepared hydrate of bromal according to the method of Löwig, by passing dry carbonic acid, saturated with bromine, into alcohol. The crystals obtained were purified by several crystallisations. He found the action of hydrate of bromal

upon the organism to vary considerably with the purity of the substance employed.

Following the analogy of chloral, it may be supposed that the hydrate of bromal is decomposed in the system into formic acid and bromoform, and that the action of bromal is therefore analogous to that of bromoform, which causes a narcotism slower than that induced by chloroform. Quantities of bromal varying from 0.06 to 0.17 grammes, were administered to rabbits by sub-cutaneous injection, producing a very long period of excitement, followed by very pronounced anæsthesia, while the hypnotism was indistinctly marked.

Experiments with Bromal Hydrate. John Dougall, M.B. (*Lancet*, 1870, ii., 913.) This paper gives an account of some experiments made with the above agent on rabbits, frogs, and, to a limited extent, on the human subject.

Bromal hydrate strongly resembles chloral in colour, although it is tinged with that of chlorine. It has an acid reaction, and is decomposed by caustic alkalies into formiate of the base, and perbromide of formyle (bromoform), the latter greatly resembling chloroform in its physical properties. Dr. Dougall confesses himself to have been unable to determine satisfactorily whether the anæsthetic and soporific properties of bromoform were equal to those of chloroform, although he is inclined to think that they are not less.

Assuming that they are equal, it would appear that in order to obtain the calmative and hypnotic phenomena produced by a given quantity of chloral hydrate (say 25 grains), an equal quantity of bromal hydrate must be given; half the amount of which, as indicated by his experiments, would be productive of highly dangerous if not fatal consequences. The phenomena evoked by its administration are almost exclusively those of bromine, the penetrating, acrid, and irritating qualities of which are only partially subdued in the salt. The anæsthesia and hypnosis referred to in the author's experiments with the bromal hydrate on animals were, he thinks, often partial, and probably more apparent than real. Applying to bromal hydrate, Liebreich's theory of the evolution of chloroform from chloral hydrate by the alkalies of the blood, it appears that, in the case of a rabbit, twelve grains were required to generate bromoform enough to cause muscular relaxation and drowsiness for about an hour, and that, too, in a small animal, with the bromoform given in a free state, in which condition it might be expected to act with concentrated energy. It seems, therefore, that a dose of bromal

hydrate, equal at least to a hypnotic dose of chloral hydrate, would require to be given to an adult human subject to represent a quantity of bromoform which might be expected theoretically to produce normal sleep, i.e., from twenty-five to thirty grains,—an amount that would undoubtedly prove fatal.

As the result of his experiments, Mr. Dougall considers that the nearest approximation to the fatal dose of bromal hydrate is in the ratio of one grain to the pound weight both of rabbits and frogs.

The manner in which it ultimately destroys life is by its powerful irritant action, intensified by a decided predilection for mucous membranes, rapidly inducing a fatal form of asphyxia. Judging from the results of Mr. Dougall's experiments, it seems improbable that bromal hydrate can ever be used to any great extent in the treatment of the pteutics; that it will ever rank with chloral hydrate as a hypnotic appears, in the meantime, impossible.

Iodoform. J. Henry Carstens, M.D. (*Detroit Rev. of Med. Pharm. Journ.*, 3rd series, i. 544.) Triiodide of formyl, or sesqui-iodide of carbon, as it was formerly called, has a chemical composition CHI_3 . It was discovered in the year 1822 by Sérullas, who prepared it by adding chlorinated lime to an alcoholic solution of iodide of potassium.

A good method for making this compound is given by Wittstein. Two parts of carbonate of potash, two parts of iodine, one part of alcohol, and five of water, are mixed in a retort, which is then heated by means of a water-bath till the contents are perfectly colourless. After the retort has cooled, the liquid is poured into a beaker and allowed to settle. The yellow scaly mass is then collected on a filter, washed thoroughly with water, and dried between filter paper. The filtrate contains a notable quantity of iodate and iodide of potassium, which the author proposes to recover in order to make the process economical.

Iodoform appears in the shape of yellow, shining, six-sided scales with a spicy odour (like saffron, or iodine and chloroform); it is volatile at ordinary temperature. Almost insoluble in water (one part in 13,000), but more soluble in alcohol (one part in 80). If it is used in a mixture, it is necessary to avoid alcoholic solutions of potash, which decomposes it, forming formate of potash and iodide of potassium.

Iodoform has lately been prominently brought to the notice of physicians in the United States as a remedy for chronic ulcers (*Proc. Penn. State Med. Soc.*, 1868), obstinate neuralgia, scrofulous strumous ophthalmia, consumption, and even in cancer is stated

have relieved the excruciating pain of this malignant disease, without seeming to arrest the same (*Medical and Surgical Reporter*, Phil., vols. xvi., xvii., xviii.). It is also a valuable dressing in chancre.

It is best administered in pill form, one to two grains, three times a day. Quevenne's iron may often be advantageously added. Externally it is used as an ointment, one-half to one drachm of iodoform to one ounce of lard; or it is dissolved in hot alcohol, and glycerine added; these to be used *pro re natâ*.

On a Reaction of Chloroform. A. W. Hofmann. (*Deut. Chem. Ges. Ber.*, iii., 769, and *Journ. Chem. Soc.*, ix., 137, 1871.) To detect small quantities of chloroform, especially in presence of ethereal compounds closely allied to it, and possessing similar properties, advantage may be taken of its behaviour with the monamines in presence of alcohol and sodium hydrate. The odour of isonitriles thereby produced is an infallible sign of the presence of chloroform. The experiment is performed by adding the liquid to be tested to a mixture of aniline (any other primary monamine, fatty or aromatic, serves equally well) and alcoholic soda. If chloroform is present, a violent reaction takes place, either immediately, or on warming gently, and the peculiar smelling vapour of the isonitrile is evolved. Bromoform and iodoform of course behave like chloroform. The reaction occurs, moreover, with all bodies capable of yielding chloroform, bromoform, or iodoform, by the action of alkalies. For example, on adding a solution of chloral in aniline to alcoholic potash, the vapour of an isonitrile is immediately evolved in abundance. *Chlorethylidene*, treated with alcoholic potash and aniline, yields no isonitrile, and is therefore easily distinguished from chloroform. The reaction here recommended is so delicate, that one part of chloroform dissolved in 5000 to 6000 parts of alcohol, may be detected with certainty.

English Chloroform. Dr. Hager. (*Pharm. Centralhalle*, 1871, p. 65.) This preparation has come into extensive use in Germany during the past year, many physicians asserting that it does not decompose spontaneously, and that consequently it can be employed with greater security. The author of the present note thinks that the chloroform manufactured in England, owes its reputation less to its real virtues than to the testimonials of English physicians, and to the formidable black bottle in which the German chloroform has to be kept by order of government. He then continues to state that if German chemists and druggists acted with common sense there would not be need for importing English chloroform. He considers that chloroform of 1.5 specific gravity is subject to spontaneous de-

composition, which is prevented by an addition of $\frac{1}{4}$ to $\frac{1}{2}$ per cent. of alcohol; and that the English manufacturers have not been slow to act upon this experience. He also states that after Scheering had shown that absolutely pure chloroform could be prepared from hydrate of chloral, the English at once took to this method, and adds, that all the very pure English chloroform in commerce has really been so prepared is proved by its behaviour to concentrated sulphuric acid: the latter does not change its colour when the chloroform comes from chloral hydrate, but becomes tinged when the chloroform has been prepared from chlorinated lime, water, and alcohol. The author concludes by recommending German chemists to act upon this information, and thus to make themselves independent from English supply.

The Distillation and Boiling Point of Glycerine. T. Bolas (*Journ. Chem. Soc.*, ix., 84.) It is well known that when glycerine, subjected to the ordinary atmospheric pressure, is heated so much as to cause ebullition, it is more or less rapidly decomposed; and that almost the whole of the glycerine may be decomposed by repeated distillation. This decomposition may be, however, entirely prevented by a reduction of the pressure in the apparatus employed to 12.50 m.m. The boiling point of glycerine was determined by effecting the distillation in a long-neck flask, having a supplementary neck attached at right angles to the principal one. In the principal neck, the thermometer was fixed by the aid of a caoutchouc cork, while the smaller neck was connected in a similar manner with a two-neck receiver. The glycerine, together with a few fragments of tobacco-pipe (this latter being required to prevent the bumping which would otherwise occur), being placed in the retort-flask, the receiver was connected with a Sprengel's mercurial pump and a manometer, the caoutchouc joints being made air-tight with glycerine in the usual way. Unless the glycerine distilled had been dehydrated by previous distillation in a vacuum, the first portion of the distillate consisted principally of water; afterwards, when the glycerine in a pure state came over, the temperature indicated by the thermometer was 179.5°C . At this time the pressure on the liquid was 12.5 m.m., a pressure nearly corresponding to the tension of aqueous vapour at the temperature of the receiver. Analysis showed that the distilled glycerine was perfectly pure and anhydrous.

Under a pressure of 50 m.m., glycerine distils without change at about 210°C . Glycerine, dehydrated by distillation, absorbs water from the atmosphere to the extent of about 50 per cent. of its weight. The amount absorbed is, as might be expected, very variable

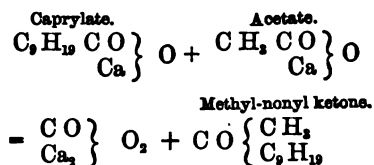
Specific Gravity of Solutions of Glycerine. M. H. Schweickert. (*Journ. de Pharm. d'Anvers*, 1870, 179.) The author gives the following table of the density of mixtures of water and glycerine, but does not indicate the temperature at which the specific gravities were taken:—

Density.	Water.	Density.	Water.
1.267	0	1.185	26
1.260	2	1.179	28
1.254	4	1.173	30
1.247	6	1.167	32
1.240	8	1.161	34
1.234	10	1.156	36
1.228	12	1.150	38
1.221	14	1.145	40
1.215	16	1.139	42
1.209	18	1.134	44
1.203	20	1.128	46
1.197	22	1.123	48
1.191	24	1.117	50

Test for Butyric Acid in Glycerine. (*Journ. Chim. Méd. and Pharm. Journ.*, 3rd series, i., 348.) Perutz states that when glycerine is gently heated with alcohol and sulphuric acid, butyric ether is formed if the glycerine contains butyric acid, and it may be recognised by its characteristic odour.

Synthesis of Oil of Rue. E. Von Gorup-Besanez and Ferd. Grimm. (*Ann. Ch. Pharm.*, clvii., 275.) The volatile oil of garden rue, which had been regarded by Gerhardt and Cahours as the aldehyde of capric acid, $C_{10}H_{20}O$, was examined by Williams and Hallwachs, who assigned to it the formula $C_{11}H_{22}O$. Hallwachs, moreover, suspected that it might turn out to be a ketone, and not an aldehyde. This view was maintained by Harbordt, who, working in Strecker's laboratory, showed that it did not undergo oxidation easily, and that it did not yield the acid $C_{10}H_{20}O_2$ on oxidation. According to Harbordt, oil of rue consists of methyl-nonyl ketone, $CO \begin{cases} C_9H_{19} \\ C_8H_{17} \end{cases}$

The authors have confirmed this formula by preparing it synthetically. They subjected to destructive distillation, at as gentle a heat as possible, a mixture of acetate of lime and caprate of lime in equivalent proportions, and obtained an oil which, on examination, turned out to be identical with the natural oil of rue, and to have the composition $C_{11}H_{22}O$. The equation explaining its production is as follows:—



It boils at 223° to 224° C., and has a sp. gr. of 0.8295 at 17.5 and forms a crystalline compound with bisulphites. The acid employed in the research had been extracted from a species of Hungarian fousel oil.

Benzyl Alcohol from Balsam of Peru. J. Kachler. (*Zeits. f. Chem.*, vi., 59.) The balsam is shaken up with twice its volume of caustic potash solution of 1.2 sp. gr., and the emulsion thus obtained is treated with ether as long as it extracts anything. The ether solution, having been separated by means of a separating funnel, is then distilled until a pale yellowish residue remains, which is left in a flat basin over the water-bath, until all trace of ether has been driven off. In this way a considerable quantity of a yellowish oil is obtained, which, with a view to purify it, was submitted to distillation; but as this could not be done without partial decomposition (with formation of stilben, $\text{C}_{14}\text{H}_{12}$) the following method was employed:—One volume of the oil was shaken up with two volumes of a concentrated alcoholic solution of caustic potash; a solid mass formed, being the potash salt of cinnamic acid. When the oil was boiled with potash solution, the cinnamic acid was contained some benzoic acid. If the above mentioned soap is dissolved in hot water, an oil separates which can be removed with a pipette. But it is not yet quite pure, as shaking up with a fresh portion of alcoholic potash solution again produces a soapy mass which, however, is no more solid, but only smeary. The benzyl alcohol is obtained in a pure state by boiling the oil with four times its volume of aqueous potash solution of 1.3 specific gravity and the two layers have united into one. On pouring the liquid into a dish it soon solidifies to a buttery mass of crystals, of the appearance of mother-of-pearl. The mass is pressed between linen, the filtrate is diluted, and submitted to distillation; the distillate, a clear liquid, contains the alcohol, which may partly be separated with a pipette, and partly by extracting with ether. The ethereal soap was distilled, the residue heated over the water-bath until all water had been chased off, and the alcohol left now united with the ether portion. The whole distilled over calcium chloride yielded a pure, colourless benzyl alcohol, $\text{C}_7\text{H}_8\text{O}$, boiling between 20°

205° C. The author gives at this occasion, the melting points of various mixtures of cinnamic and benzoic acids:

Cinnamic Acid.	Benzoic Acid.	Melting Point.
100 (in 100 parts)	0 (in 100 parts)	133·3° C.
99	1	131·8
90	10	126·6
80	20	118·0
70	30	108·2
60	40	98·7
50	50	84·3
40	60	87·1
30	70	101·4
20	80	106·4
10	90	111·5
1	99	118·2
0	100	123·3

Resin of Balsam of Peru.—The alcoholic solution of the balsam, after having been extracted with ether, leaves, on heating away all traces of ether, a residue, which on addition of hydrochloric acid yields a soft brown resin, possessing a pleasant fragrance of vanilla. On boiling it with water, it becomes solid and brittle. Its concentrated alcoholic solution mixes with a concentrated alcoholic solution of potash without separation of a potash salt. Heated with three times its weight of caustic potash until a sample dissolved in water gave but little separated matter, then dissolved in water, filtered, the filtrate extracted with ether, the ether solution distilled off, the remaining residue treated with carbon bisulphide, a small quantity of benzoic acid could be obtained. That portion of the residue, which remained undissolved in the carbon disulphide proved, after purification with animal charcoal, to be proto-catechuic acid. The amount of benzylic alcohol obtainable from the balsam of Peru is so considerable that this balsam may be recommended as a very good substance for the production of that alcohol. On the average 100 pts. of balsam gave 20 pts. of benzylic alcohol, 46 pts. crude cinnamic acid, and 32 pts. resin.

The author was unable to discover, contrary to a statement by Delafontaine, any cinnamic alcohol in the benzylic alcohol.

On Benzoin and Benzoic Acid. Julius Loewe. (*Zeitschrift f. Chemie*, 1870, 298.)

To determine whether benzoic acid exists free in benzoin, or whether it is generated by heating the resin, the author sought to answer the following four queries:—1. Does benzoic acid exist ready formed in benzoin? 2. Is benzoic acid in the resin united with a

base? 3. Is benzoic acid formed through the influence of the air upon the fused resin? 4. Is benzoic acid a product of decomposition of a body contained in the resin?

A large quantity of benzoin was intimately mixed. Three portions of it, each weighing 15 grms., were heated in the usual manner, in a dish covered with paper; one in contact with the air, one in a current of hydrogen, and the third in carbonic acid; 2.2, 2.5 and 2.4 grm. benzoic acid were obtained; therefore, an oxidation of the resin to benzoic acid, does not take place on fusion in atmospheric air.

30 grms. of benzoin were dissolved in 95 per cent. of alcohol, and the filtered solution mixed with an alcoholic solution of caustic soda. A red brown sediment had occurred after 48 hours, which was well washed upon a filter with alcohol, dissolved in water, and decomposed by boiling with muriatic acid; an amorphous precipitate separated, which, after filtering, yielded benzoic acid on being heated. If free benzoic acid had been contained in the resin, it would have entered the soda precipitate and been separated in crystals by the muriatic acid; since, however, it is obtained from the amorphous precipitate only by heat, the author concludes that benzoic acid as such was not present.

The filtrate from the soda precipitate was distilled; the amorphous residue dissolved in water, yielded with muriatic acid, a resinous precipitate, giving a copious sublimate of benzoic acid, while the acid filtrate on concentration yielded only small quantities of crystalline benzoic acid. The author concludes from this experiment, that at least a portion of benzoic acid does not exist ready formed in the resin.

A portion of benzoin was dissolved in alcohol, the solution at the boiling point precipitated with water, the alcohol distilled off, and the aqueous solution decanted from the sediment; this was repeated four times in the same manner; at last the alcohol was not distilled off, but was removed with the water. The resin thus purified, behaves towards soda and muriatic acid essentially like the crude benzoin. The aqueous, faintly alcoholic solutions did not give crystals of benzoic acid on evaporation; a small quantity however, was present, its crystallisation being prevented by the presence of a resinous body.

These results led the author to the conclusion that some benzoic acid is present in the resin; but that the greater portion generated on heating, from one of the proximate principles co-existent in benzoin.

Of all the different apparatus recommended for the sublimation of benzoic acid, the author prefers that of Mohr; but recommends a steady temperature of 170° C. A flat vessel of iron or copper is connected with a glass tube bent upwards, into which a thermometer is inserted, while the vessel is covered with paper. The purest acid was obtained by mixing the resin with an equal weight of crude oil of vitriol free from nitric acid; this mixture, put into a leaden vessel is placed into the iron or copper vessel, and then slowly heated to the above temperature to prevent its foaming over.

The use of Preparations of Carbolic Acid in Small-Pox Epidemics.
MM. Dubarth and Rolle. (*Echo Méd. et Pharm. Belge.*, and *Journ. Pharm.*, 3rd series, i., 626.)

Although carbolic acid is not a preservative, enabling us to dispense with vaccination, it is nevertheless a disinfecting agent which it is advisable to employ as a prophylactic. In a hygienic point of view it is thought worth while to call attention to two new preparations, or rather two different forms of the same preparation, which are due to MM. Dubarth and Rolle.

The best method of employing carbolic acid as a disinfectant, according to M. Dubarth, is to mix it with a coarse powder, which being saturated with it, so divides the acid as to present the largest possible surface for evaporation. For this purpose powdered brick affords an excellent vehicle, at once convenient and easy in its use.

The following is the manner in which he prepares this mixture, to which he has given the name of "Dubarth's Disinfectant."

Powdered Brick	5 kil.
Carbolic Acid	250 gr.

Dissolve the acid in a sufficient quantity of alcohol, and then mix. A thin layer of this powder spread upon a plate, frequently stirred and slightly damped, produces at the ordinary temperature a much larger quantity of antiniasmatic vapours than would be given off by any solution of carbolic acid. It is superior to the solutions of permanganate of potash, its effects being more constant and more certain.

The following is the method proposed by M. Rolle for making carbolicized cigarettes:—

Powdered Plaster	100
Carbolic Acid	20

Dissolve the carbolic acid with a sufficient quantity of alcohol, and sprinkle with this solution the granulated plaster. Stir with a spatula in order to secure an equal distribution of the active sub-

stance, then introduce the granules into the hollow portion of a quill, of which the ends are closed with a little wadding, as is done in the case of camphor cigarettes.

As an agent in the treatment of confirmed small-pox, carbolic acid has been largely experimented with since the first trials by M. Chaffard, with results proportionate to the gravity of the evil. Professor Godefroy, of Rennes, has had three cases of small-pox, in which he has obtained such satisfactory results by the use of it, that he has published the particulars in the *Revue de Thérapeutique Médico-Chirurgicale*.

The first was the case of an unvaccinated adult, suffering from semiconfluent small-pox. The prescription ordered was—

Mixture of Acacia (Potion gommeuse, Fr. Codex) 125 grammes.
Crystallised Carbolic Acid 1 „

Two tablespoonfuls to be taken every two hours.

The following lotion was to be applied every hour to the face and hands :—

Crystallised Carbolic Acid 5 grammes.
Distilled Water 500 „

There was no suppuration.

The second case was that of a confluent variolic eruption. The same treatment was adopted. There was no suppuration.

The third case was an infant of eighteen months. The eruption was moderate. Without ceasing to suck, this child took a teaspoonful of a solution of 30 centigrammes. The hands were bathed with a lotion made according to the formula previously given. It recovered.

It is well to remark that these three cases were too slight to decide in favour of the efficacy of carbolic acid; but they at least prove that the acid can be administered without inconvenience.

On Sulphocarbolic Acid and the Sulphocarbulates.—T. Omar Gay. (*Amer. Journ. Pharm.*, xlii., 209.) These chemical combinations having recently come before the medical world as new therapeutical agents, the author has subjected them to investigation.

Sulphocarbolic Acid.—This is first formed by combining, by aid of heat, sulphuric and carbolic acids, in the proportion of 49 parts by weight of the former to 94 parts by weight of the latter, or one equivalent of each.

The mixture is put into a flask with a narrow top, into which is inserted a thermometer, and covered over by means of a paper

diaphragm, in order to keep the fumes from escaping. It is then placed on a sand-bath, and heat gradually applied, until the acid is raised to the temperature of 290° F., and kept at this point for ten or fifteen minutes, and then allowed to gradually cool.

At first this forms a thick syrupy liquid of a rich wine colour, which, in time, passes into a crystalline mass, composed of small rhomboidal crystals, having a reddish-brown appearance. This again becomes liquid at or about 80° F.

When the two acids are first mixed, heat is evolved, the temperature being raised to 190° F. Fumes are given off, which are again condensed on the sides of the vessel. These have an odour similar to carbolic acid, though differing in some respects.

Sulphocarbolic acid reddens litmus; with the sesquichloride of iron, also with the solution of the pernitate of iron, it produces a beautiful purple colour, which fades when exposed to the sunlight for a short time. With chloride of barium, nitrate of barium, and the acetate of lead, it produces a slight opalescence, which is probably owing to a little free sulphuric acid.

Its taste is at first strongly acid, leaving a slight empyreumatic taste upon the tongue. It also has a strong empyreumatic odour, resembling, to some extent, carbolic acid. Its sp. gr. is 1.288; it boils at 540° F., and is decomposed at 560° F., into a black, shiny, amorphous mass, without odour; which is soluble in water and alcohol, and gives a decided reaction with the soluble barium and lead salts.

The acid is soluble in any proportion of water, alcohol, and ether. It dissolves iodine, and the solution will combine with water, without throwing the iodine out of solution.

When heated to 400° F. it becomes of a bright red colour, and when cooled forms an almost semi-solid mass. If nitric acid is added to a portion of sulphocarbolic acid, it is immediately decomposed with violence, nitrophenic acid being formed—a black, oily liquid, giving off a peculiarly disagreeable odour, entirely different from that of carbolic acid.

In forming the sulphocarbolic acid, chemically pure sulphuric acid, sp. gr. 1.823, and Calvert's No. 2 carbolic acid should be used.

Sulphocarbolic acid has been experimented with in regard to its disinfectant properties, and found to be much more efficient than carbolic acid alone.*

With salifiable bases it combines and forms salts, which have been called sulphocarbolates. These have a faint odour of carbolic acid,

* Vide "Pharmacist," Chicago, September, 1869.

and are supposed to have its therapeutical properties with causticity, rendering it suitable for internal administration.

In heating the acid great care should be used not to heat suddenly. There is apt to form at the bottom of the vessel liquid, caused by too great a temperature, resulting in the position of the acid.

Sulphocarbolate of Soda.—This salt is at present considered most important of the series. It may be produced by taking volume of sulphocarbolic acid, adding six volumes of water completely saturating with carbonate of soda in crystals. The solution is then filtered and evaporated slowly over a sand or water bath until a slight pellicle is formed, when it is set to crystallise. When the crystals are all formed, the mother-water be still further evaporated, and a new crop of crystals obtained.

Should they contain colouring matter, or the crystals not formed, a re-solution and crystallisation will produce a beautiful free from colouring matter, and of well-defined rhomboidal crystals soluble in five parts of cold water at 60° F., and in two-thirds weight of boiling water; soluble to a slight extent in alcohol insoluble in ether.

Sulphocarbolate of soda is a nearly colourless salt, possesses a slight pinkish tinge. It has a somewhat saline, bitterish taste, a faint odour of carbolic acid; neutral to test-paper; produces a white precipitate with chloride of barium, nitrate of baryta, or the acetate of lead. With the sesquichloride of iron and the liquor ferri it produces a beautiful purple colour, characteristic of the carbolic acid.

The crystals should be well dried by exposing them to the sun in a warm place on filtering or porous paper.

In heating this salt to a high degree, it loses thirty per cent weight, and falls into a greyish-white powder, giving a white precipitate with chloride of barium, nitrate of baryta, and acetate of lead. With the sesquichloride of iron and the solution of ternitrate of iron it produces a deep reddish colour. If the heat is continued long enough it takes fire, and burns without flame. Nitric acid, added to a solution of the salt, gradually acquires a reddish-brown colour.

The therapeutical properties of sulphocarbolate of soda have been thoroughly investigated. It has been used in phthisis with marked success; also in zymotic diseases with favourable results. It has been given in doses ranging from ten to sixty grains.*

Several physicians of this city have used the sulphocarbolate

* Vide "London Practitioner," July, 1869.

soda in the treatment of disease. Among the number the following have been reported. One case was that of Anna E—, having suffered from ozena for several years. The sulphocarbolate of soda was used, varying the strength from two to eight grains to the fluid ounce of water. It was used twice daily, with Thudichum's nasary douche, with the most flattering success.

It was also used as a topical application in a case of syphilitic sore-mouth with good results. In this case the strength of the solution used was ʒi. to ʒiv. of water.

As a dressing for fetid leg ulcers the solution of the sulphocarbulates possesses one advantage over the carbolic acid; the acid in oil or paste is at first generally too stimulating, but soon volatilizes, leaving the oil or paste inert. The sulphocarbulates being less volatile, but at the same time possessing the antiseptic qualities, a more uniform application is obtained.

This salt was used in several cases of severe tonsillar ulceration, which all rapidly recovered without the occurrence of suppuration.

It was also employed in several severe cases of scarlet fever, every case of which recovered in a less period of time than under any treatment which had previously been employed in similar cases.

Sulphocarbolic Acid and the Sulphocarbulates. J. Creuse. (*Amer. Journ. Pharm.*, xliii., 10.) The author quotes some experiments in support of his opinion that sulphocarbolic acid is composed of three equivalents of sulphuric acid, and one of carbolic acid; and that sulphocarbulates contain two equivalents of the acid, and three of the base. He also gives the following useful formula for the preparation of pure sulphocarbolic acid.

Carbolic acid (Calvert's No. 1)	188 grams.
Sulphuric acid, pure, 79 p.c.	607 „
Carbonate baryta	q.s., or 636 grs.

Melt the carbolic acid, add to it the sulphuric acid by small portions, and let stand in a warm place till all smell of carbolic acid has disappeared. Dilute the liquid with eight times its volume of water, add the carbonate baryta, bring to ebullition, and filter. The filtrate should give no precipitate with either sulphuric acid or nitrate baryta.

As sulphuric acid is of variable strength, and the quantity of carbonate of baryta is intended only to accurately saturate and remove the free sulphuric acid, it may be necessary to add to the filtrate a little carbonate baryta or sulphuric acid, till it answers the requisite test. The liquid should be then evaporated at a

gentle heat, away from the influence of light, and allowed to crystallise.

Pure sulphocarboic acid is colourless, has no smell, dissolves in water, alcohol, and ether, in all proportions; it does not seem to possess any antiseptic properties, for its watery solution becomes mouldy in forty-eight hours when the weather is warm. Nitric acid, especially with the help of heat, decomposes it, forming, among other compounds, picric and sulphuric acids.

Sulphocarbonate of Soda.—This salt may be prepared by saturating sulphocarboic acid by carbonate of soda. By evaporation, abundant crystals are obtained without difficulty. Sulphocarbonate of soda is inodorous, almost colourless; it is reddened by exposure to direct sunlight. The shape of its crystals is very much like that of sulphate of zinc. It is neither efflorescent nor deliquescent. It tastes like sulphate of soda; slightly bitter and salty, but not acid. It dissolves readily in water, less so in alcohol, not at all in ether. Nitrate of baryta causes no precipitate in its solution. Sulphocarbonate of soda cannot be kept in weak solution without turning mouldy in warm weather. It is decomposed by nitric acid into sulphate of soda, free sulphuric and picric acids, etc.

Sulphocarbonate of zinc is obtained by saturating sulphocarboic acid with a slight excess of carbonate or oxide of zinc recently precipitated. It crystallises easily, in the shape of flattened prisms. It has no smell, no colour, or hardly any, and tastes very much like sulphate of zinc. It is soluble in water and in alcohol. It is not precipitated by salts of baryta. Direct sunlight affects much more than the corresponding salt of soda, so that it is more difficult to obtain colourless. It is decomposed by nitric acid in the same manner as sulphocarbonate of soda. Its solutions turn mouldy in warm weather unless they are concentrated.

The other sulphocarbonates may be prepared in the same manner should any be required.

Sulphocarbonate of Zinc. Dr. A. B. Lyons. (*Amer. Journ. Pharmacy*, xlii., 508.) The author recommends the following process for the preparation of sulphocarbonate of zinc as simple, economical, and satisfactory:—A crude sulphocarboic acid is first prepared in the usual way by heating together sulphuric and carboic acids; seventeen parts of the former to sixteen of the latter. This is diluted with ten times its volume of water, and saturated with carbonate of lead. Into the filtered solution of sulphocarbonate of lead is introduced a quantity of pure granulated zinc, equal in weight to the carboic acid employed. At the end of twenty-four hours the solution will usually be found

free from lead, giving no precipitate with sulphuric acid or potassium iodide. When quite freed from lead, as indicated by these tests, the solution is decanted, heated to boiling, filtered, and evaporated to a small bulk to crystallise; or the evaporation is carried to complete dryness, the salt being obtained in the granular form. The salt procured in this way is of necessity free from sulphate, and yields fine large colourless crystals, without any empyreumatic odour.

Mr. T. H. Hustwick, commenting upon the foregoing in the *Pharm. Journal* (3rd series, i., 845) writes as follows:—

“From communications to this and other journals on the preparation of some of the above salts, I have gathered that the formation of sulphocarbolate of zinc is best accomplished by a process of decomposition or displacement. In a late number of this journal (No. 39) is given a process for the preparation of this salt by decomposing sulphocarbolate of lead by metallic zinc. Doubtless the salt of zinc thus formed is of great purity: but is it not possible that a salt of equal purity may be obtained by direct combination, saving both time and trouble? My own experience leads me to suppose that it may. I have made considerable quantities of sulphocarbolates, and the *modus operandi* followed by me has been, in its essentials, that recommended by Mr. C. H. Wood in this journal (vol. x., 2nd series, p. 428); this process, however, gives a salt more or less coloured, and less crystallised than when pure. Where one of the alkalies or alkaline earths is the base, nothing more is required than to evaporate the neutral solution so far as to produce a good crop of crystals; these are to be well drained, and redissolved for a second crystallisation. For the zinc salt I have saturated the diluted acid with the oxide, evaporating the solution till, when quite cold, a nearly solid mass of crystals is left in the bottom of the basin: this reddish-coloured magma is well broken up, and allowed to rest a short time, when the supernatant liquor may be removed, the remainder placed in a calico cloth and strongly pressed, by which a further quantity of red mother-liquor is got rid of, leaving a cake of sulphocarbolate nearly pure; this, when again dissolved, filtered, and sufficiently evaporated, yields the salt in a state of purity far surpassing any other sample I have ever seen. As the expressed cake is so nearly pure, almost the whole of it may be recovered by further evaporation. This procedure applies equally to iron and copper. To obtain the copper-salt, the diluted acid is saturated with freshly-prepared moist carbonate of copper, producing a beautiful intensely green solution,

which, no doubt will make an excellent colour for druggists' show-bottles. The crystals, when large, are a brilliant blue, and form clusters of great beauty, but difficult to obtain as single crystals; when small, they are green, probably from containing less water of crystallisation.

The iron salt was obtained by the action of the acid on fine iron wire; the colour of the crude solution is a most intense violet and, like that of copper, would doubtless make a good colour for show-bottles. The expressed cake, though almost white, when dissolved, reproduces the characteristic violet in almost its original intensity. The crystals produced from this solution are violet-green the green predominating. Before their removal from the evaporation basin, they should be carefully washed with ice-cold water by means of a syringe, in order to free them from the coloured mother liquor, which adheres with great pertinacity. A peculiarity of the salt is, that a freshly prepared solution is almost colourless, and without a trace of violet, but as it absorbs oxygen, peroxide of iron is precipitated, the violet tinge once more appears, and increases in intensity till it almost equals, in that respect, the crude solution.

These salts are all easily prepared, are very stable, and as they crystallise from pure solutions with great facility, and into regular geometric forms, they make capital show-objects. Some crystals, the calcium salt that I now have are perfect rhombs. The vessel in which all the solutions, during the progress of crystallisation, climb up and over the sides of the basin, by the force of capillary attraction, is rather astonishing, unequalled, as far as my observation goes, by any other compound; it is rather a nuisance, but may be completely prevented by slightly greasing the inside of the vessel. Into the chemical part of the question it is not my purpose to go, but the remarkable changes exhibited by some at least, of the sulphocarbulates, under the action of high temperatures, shows there is room for further investigation. Exposed to the heat from a Bunsen's burner, the soda and potash salts exhibit all shades of colour from pale pink to intense purple; and afterwards placed on the glowing embers of a bright fire, combustion takes place in a very similar manner to the old Pharaoh's serpents, leaving an ash equally bulky and eccentric.

Crystallisation of Sulphocarbolate of Quinia. C. J. Rademaker, M.D. (*Amer. Journ. Pharm.*, xlii., 506.) The author having had occasion to prepare sulphocarbolate of quinine, for hospital use, the following process was resorted to:—

Crude sulphocarbolic acid was saturated with plumbic carbon-

ate, the sulphocarbolate of lead crystallised, and decomposed with sulphate of quinine. The solution of sulphocarbolate of quinine was filtered and evaporated, but it was found almost impossible to crystallise the salt, owing to the gelatinous condition of part of the solution, which adhered to the small amount of crystals formed. The gelatinous mass was redissolved in alcohol, and set aside to evaporate spontaneously, with the same result, it being found impossible to remove the crystals with any degree of nicety from the gelatinous mass. A solution of sulpho-carbolate of quinine of definite strength was then made, a teaspoonful of the solution representing two grains of the crystallised salt, or as near two grains as could be calculated from the amount of substance used. The liquid was composed of three parts water and one part alcohol, and set aside for prescription use. In about four or five weeks small crystals were noticed which gradually increased in size, the larger crystals resembling those of perchloride of iron. Under the microscope they made a beautiful prismatic appearance; but to what system of prisms they belonged could not be determined. Part of the crystals were taken out of the bottle and examined, and found to be sulphocarbolate of quinine.

In about two months, about one-third of the salt had crystallised out of the solution. The salt was freely soluble in water, but slightly soluble in alcohol, and not deliquescent.

On the formation of Lactic Acid from Sugar without Fermentation. F. Hoppe-Seyler. (*Deut. Chem. Ges. Ber.*, iv., 346, and *Journ. Chem. Soc.*, ix., 546, 1871.) When one pound of grape-sugar is placed in a capacious retort with $\frac{1}{2}$ litre of soda-solution of 1.34 sp. gr., and an equal quantity of water, and heated in a water-bath, violent action sets in at 96°, and the temperature rises to 116°, the liquid boiling violently. After cooling, the liquid is neutralized with dilute sulphuric acid, and evaporated. On shaking with ether, lactic acid, a little oxyphenic acid, and other bodies dissolve. The ether is shaken with barium carbonate and water; and the barium salt is then changed into a zinc salt, and recrystallised a few times, whereby it is obtained perfectly pure. From the percentage of water of crystallisation in the zinc salt, and from the solubilities of the zinc and calcium salts, the acid must be the normal lactic acid or ethylidene-lactic acid. A concentrated aqueous solution of the acid does not show circular polarization.

Lactic acid and calcium lactate are unchanged by water at 200°; neither is lactic acid produced by the action of water on sugar or paper at 200°.

The Composition of the Acid Oxalates of Potassium, Ammonium, and Sodium. W. R. Nichols. (*Chem. News*, xxii., 14.)

Binoxalate of Potash.—In Gmelin, Watts, and other chemical works, this salt is generally represented as containing one molecule of water of crystallisation, $\text{KHC}_2\text{O}_4 \cdot \text{H}_2\text{O}$. Rammelsberg, however, describes the salt as corresponding to the formula $4(\text{KHC}_2\text{O}_4) \cdot \text{H}_2\text{O}$; and Marignac, having afterwards partially analysed this salt, concluded that it was anhydrous, and correctly represented by KHC_2O_4 . The author, having prepared the salt in the manner indicated by Rammelsberg, made a number of analyses of it. The results closely agreed with each other, and showed that Rammelsberg's formula ($4(\text{KHC}_2\text{O}_4) \cdot \text{H}_2\text{O}$) is the correct one.

The potassium was determined as carbonate by ignition. The oxalic acid was determined by titration with a solution of permanganate of potash, standardised against pure oxalic acid. The hydrogen was determined by igniting the salt, in a combustion tube, in a stream of dry air, and collecting the water in a weighed chloride of calcium tube. The analysis of several samples of commercial "binoxalate of potash" proved them to be quadroxalate.

Binoxalate of Ammonium.—This salt was prepared by neutralising a certain quantity of oxalic acid with ammonia water, and then adding a quantity of oxalic acid equal to that neutralised. Analysis showed the composition of this salt to be $2(\text{NH}_4\text{HC}_2\text{O}_4) \cdot \text{H}_2\text{O}$. The text-books usually represent the salt with twice this amount of water. Anderson says that the binoxalate of ammonium may be obtained by mixing equivalent quantities of chloride of ammonium and oxalic acid. The author finds that the salt so formed is really the quadroxalate: $\text{NH}_4\text{HC}_2\text{O}_4 \cdot \text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$.

Binoxalate of Sodium.—According to Anderson, by dissolving equivalent proportions of oxalic acid and chloride of sodium in hot water, crystals of binoxalate of sodium are obtained. The author confirms this statement, and shows that the resulting salt accords with the commonly received formula, $\text{NaHC}_2\text{O}_4 \cdot \text{H}_2\text{O}$.

Impure Acetic Acid. (*Amer. Journ. Pharm.*, xlii., 389.) Dr. Bruckner, of Philadelphia, reports that he has found acetic acid to contain phosphate of lime. This is a fact of importance in reference to the use of acetic acid in the analysis of phosphatic materials. The author suggests that the phosphate may have been derived from bone black, used for decolorizing the acid.

The Prevention of Mouldiness in Aqueous Solutions of Tartaric Acid. W. H. Wood. (*Chem. News*, xxii., p. 13.) The author finds that the addition of a single drop of creasote to an ounce of

solution of tartaric acid is sufficient to permanently prevent the formation of mould which otherwise occurs. Pure carbolic acid is equally efficient.

Double Tartrate of the Sesquioxide of Manganese and Potash. M. Deschamps. (*Journ. de Pharm. d'Anvers*, 1870, 346.) This salt occurs in small garnet-red crystals, very soluble in water, very alterable, and possessing the same composition as emetic tartar. It is formed by pouring a solution of cream of tartar, saturated at about 40° C., upon sesquioxide, or, better, hydrated binoxide of manganese. Care should be taken to cool the vessel in which the operation is performed. A very deep red liquor is obtained, which, after filtration to separate the excess of oxide, deposits after several days red crystals of this double salt. The solution of this compound is very easily altered by heat; commencing to decompose towards 50° or 60° C. At a higher temperature the decomposition occurs instantly, and is accompanied by a disengagement of oxygen.

The author has also obtained this salt by the action of permanganate of potash upon tartaric acid or tartrate of potash in solution, by preventing any great rise of temperature; but it is difficult in this way to obtain the salt in the crystallised state.

New Source of Citric Acid. (*Cosmos*, and *Journ. de Pharm.*, 4th series, xii., 137.) Professor O. Silvester, of the University of Catania, has recently discovered the presence of citric acid in the fruit of *Cyphomandra betacea*, a solanaceous plant, growing in the gardens of Sicily. It is a native of Mexico, and is known through Peru and other parts of South America under the name of *tomate de la paz*. It is a woody plant, which attains a height of about 4 metres. Its fruits yield from 1 to 1.5 per cent. of pure citric acid.

Remarks on the Granular Salt of Citrate of Magnesia. H. C. Archibald. (*Amer. Journ. Pharm.*, xlii., 231.) The attention of the author was first called to the English article of granular citrate of magnesia, so called, in the spring of 1867, and a few experiments demonstrated the fact that its component parts consisted principally of tartaric acid, bicarbonate of soda, sugar, and a trace of magnesia.

To obtain a preparation that could be properly called granular citrate of magnesia, and having at the same time effervescing properties by the direct union of citric acid and magnesia, was found, by the writer, to be impracticable, and the idea was abandoned.

After a series of experiments to ascertain whether a granular salt could be made, which would contain citrate of magnesia, and at the same time be effervescent and perfectly soluble, the following formula was adopted, which, if it be strictly adhered to,

will afford a beautiful salt, possessing decided laxative properties and very acceptable to the palate:—

℞ Acid Citric powdered	4 lbs.
Magnesia Calc. (Jennings')	1½ „
Sodæ Bicarb. (Chance's)	3 „
Acid Tart.	3 „
Pulv. Sacch. Alb.	6 „
Ol. Limonis	½ fl. oz.
Alcohol Fort.	q. s.

To the powdered citric acid add the sugar, and mix thoroughly; then add the soda, magnesia, and tartaric acid, pass the whole through a No. 40 sieve three times, to insure its being thoroughly mixed; moisten the powder with stronger alcohol, and pass through a No. 8 sieve, and place on a tray made of wood in a warm room to dry; then add the oil of lemon, and bottle instantly. It usually takes twenty-four hours and a temperature of 120° to perfectly dry the salt.

The resulting preparation is uniform in its action, and can be kept indefinitely without injury; it is freely soluble, dissolving almost instantly on being thrown into water, and forming a perfectly clear solution without residue; it has also a pleasant acid taste.

Like almost all other things, this process requires skilful manipulating to insure good results. The author has made several thousand pounds of this salt, and has invariably found that whenever the directions were implicitly carried out, satisfactory products were the result.

Cyclopic Acid; a new Fluorescent Substance. A. H. Church. (*Chem. News.*, xxii. 2.) One of the plants used by the African boers for tea is the *Cyclopia Vogelii*. Endeavouring to extract theine from the dried leaves and flowers of this plant, the author met with an apparently new substance, possessing to a remarkable degree the property of fluorescence. When a crystal or two of the new body is dropped into a solution of caustic soda and viewed in sunlight, an intense greenish yellow fluorescence is perceived which disappears in the course of some hours. The author has named the new substance *Cyclopic Acid*. It is extracted by enclosing a pound or so of the dried leaves in a cloth, and immersing for some days in water at about 30° or 40° C., occasionally squeezing the cloth. A yellow powder gradually accumulates at the bottom of the vessel of water, which is dissolved in a mixture of ether, alcohol and water, acidified with a drop of acetic acid.

By two or three re-crystallisations from weak alcohol, the cyclopic acid is obtained pure. The results of analysis correspond pretty fairly with the formula $C_7H_6O_4$. This formula is rendered more probable by the result of neutralising cyclopic acid with a standard solution of ammonia. The formula indicated for the ammonium cycloplate thus produced is $C_7H_6(NH_4)_2O_4$.

It is possible, however, that cyclopic acid contains more hydrogen than is here assumed, in which case it would have the formula $C_{14}H_{12}O_8$, and its ammonium salt be $C_{14}H_{14}(NH_4)_4O_8$.

Preparation of Tannin. (*Archiv. de Pharm.*, 1870, 232, 233.) Oscar Rothe proposes the following process, which he has found well adapted to Chinese galls: 8 parts powdered galls are macerated with 12 p. ether and 3 p. strong alcohol for two days, the liquid decanted, the residue treated with the same solvents and expressed. The liquid is decanted from the sediment, mixed with 12 p. water, the alcohol and ether recovered by distillation, the aqueous solution rapidly filtered and quickly evaporated in a steam-bath, the residue dried and powdered.

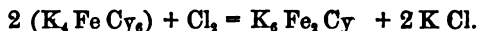
On Rufigallic Acid. By Dr. J. Löwe. (*Journ. pr. Chim.* vii., 296.) As early as in 1836 it had already been noticed by Robiquet that the above acid is formed on treating gallic acid with concentrated sulphuric acid. The author now finds that it is not necessary to raise the temperature during the experiment to 143° , as directed by Robiquet, but that the heat of the water-bath suffices. It is further noticed by the author that during the reaction sulphurous acid and carbonic acid are set free, whilst it was until now supposed that rufigallic acid is formed from gallic acid through the latter losing water. Dried over sulphuric acid, rufigallic acid appears as a red-brown powder, insoluble in water, to but a small extent soluble in alcohol and ether. The alcoholic solution gives on addition of iron oxide salts a black-brown colouration, but no precipitate. Lead acetate and copper nitrate precipitate the acid. Mercury chloride has no effect on it. Dilute potassic hydrate solution dissolves the acid, from which solution it is precipitated by carbonic acid. Concentrated solutions of caustic potash form with the acid an insoluble blueish-black salt, from which too the acid can be regained through acids. Dried at 120° , it gave on analysis figures leading to the formula $C_{20}H_6O_{12}$.

On Rufigallic Acid. By B. Taffe. (*Deutsch. Chem. Gesell. Ber.*, iii., 694.) Theoretical considerations led the author to the supposition that this acid stands in some definite relation to alizarin. With the view of ascertaining this, he submitted the acid, mixed

with powdered zinc, to distillation, and obtained anthracen. This reaction may perhaps lead to some knowledge of the formation of the colouring matters in plants. The various tannic acids, usually accompanying those colouring bodies most likely play an important rôle in their production. It would be interesting to examine whether protocatechuic acid, which appears as a product of decomposition of many colouring matters, is capable of similar reaction to that of gallic acid.

Note on the Oxidation of Pyrogallic Acid. By Aimé Girard. (*Zeitschr. f. Chim.*, vi., 86.) If a solution of silver nitrate is mixed with a solution of pyrogallic acid, and the rapidly-forming precipitate is dissolved in alcohol, it becomes evident that this precipitate contains, besides the reduced silver, a red volatile substance which has a remarkable though only superficial resemblance to alizarin and purpurin. Its composition corresponds to the formula $C_{12}H_8O_7$. Other oxidising bodies, as potassic permanganate and sulphuric acid, yield the same result. The author calls the substance *purpurogallin*. It sublimes in dark red needles at about $200^\circ C.$, is little soluble in water, but easier so in alcohol, ether, and benzol; the solutions are yellow. The author gives a list of reagents with which a solution of purpurogallin gives variously coloured reactions; and concludes by stating that it dyes very well mordanted fabrics, but the colours produced are not very fine.

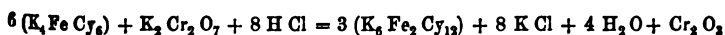
The Preparation of Ferridcyanide of Potassium. William T. Wenzell. (*Pharmacist*, iv., 49.) Ferridcyanide of potassium is usually prepared by the process of Gmelin, the discoverer of this salt, by passing chlorine slowly into a dilute solution of yellow prussiate of potash, until the liquid ceases to yield a precipitate on the addition of a persalt of iron. The chemical reaction which takes place in this process depends upon chlorine abstracting two atoms of potassium from two molecules of ferrocyanide of potassium, which coalesce to form one molecule of the ferridcyanide of potassium, chloride of potassium being formed at the same time, as follows:—



This process is no doubt one of the best, when the action of the chlorine can be interrupted in time to prevent the decomposition of a portion of the product into chloride of cyanogen and various secondary compounds, which are known to act injuriously by their presence in preventing, to some extent, the subsequent crystallisation of the salt. This loss and inconvenience is avoided, according

to Professor Reichardt, of Jena,* by substituting bromine for chlorine, which will prevent the occurrence of the decomposition to which the ferridcyanide is liable by the prolonged action of chlorine. Aside from this advantage, the author recommends his process on the ground of the greater facility with which the salt is prepared. The reaction is in every way identical with that of chlorine, the product being ferridcyanide of potassium and bromide of potassium. In regard to the economy of a process, which calls for the use of bromine,—an article, although of late years greatly reduced in value,—few manufacturers could be induced to adopt such an expensive substitute.

The process which the author has used for years, and for which he claims results as advantageous as the bromine process, with the additional desideratum of cheapness, is based on the action of chlorine, which is formed and made to act upon the yellow prussiate *in statu nascenti* during the process. Eight molecules of hydrochloric acid and one of bichromate of potash are made to act upon a boiling solution of ferrocyanide of potassium; ferrideyanide of potassium, chloride of potassium, sesquioxide of chromium, and water are formed, as exemplified by the following equation:—



The following formula will give satisfactory results:—

Bichromate of Potash	1 part.
Ferrocyanide of Potassium Cryst.	5.72 parts.
Muriatic Acid, spec. grav. 1.16	8 parts, by weight.
Water	60 parts.

Dissolve the two salts in hot water, add the acid, heat to boiling, continuing the ebullition, replacing the water evaporated during the process until a portion of the filtered liquid is not precipitated on the addition of sesquichloride of iron. When reaction is completed, filter the liquid, and wash the hydrated sesquioxide of chromium, unite the liquids, and concentrate to crystallisation. If the evaporated liquid possess an acid reaction, the addition of caustic potash, in sufficient quantity to cause a weak alkaline reaction, will greatly facilitate the subsequent crystallisation. Generally, there is no difficulty experienced by following these processes if the relative proportions are used in the prescribed equivalent amounts. An excess of muriatic acid should be studiously avoided, inasmuch as an excess will contaminate the solution of red prussiate of potash with

* Dingler's Polytechn. Journal, Dec., 1869.

sesquichloride of chromium, which will communicate an emerald green colour, and give a green precipitate of hydrated sesquioxide chromium on the addition of ammonia.

On the Action of Light on Red Prussiate of Potash. Dr. Vogel. (*Deut. Chem. Ges. Ber.*, iv., 90-94, and *Journ. Chem. Soc.*, ix., 303, 1871.) It is well known that solutions of red prussiate readily suffer decomposition, yellow prussiate and a blue precipitate being formed. The presence of organic matter facilitates this decomposition considerably. Light seems, however, to be the direct cause. A solution of 1 part freshly prepared ferricyanide of potassium in 10 parts of water, when exposed to diffused daylight becomes darker in colour in the course of a few hours, while, when it is exposed to direct sunlight, the production of ferrocyanide may be demonstrated by means of ferric chloride, even after the lapse of thirty seconds. Yellow light is without action on the solution, and no alteration was observed to take place in the solid salt. This action may be made use of for the production of photographic pictures; but this, owing to the mutable character of cyanide compounds, is not likely to be of any practical importance at present. Manufacturers may, however, find it advantageous to evaporate and crystallise solutions of red prussiate in the dark, or in lamplight; and chemists should keep their best solution of ferricyanide in bottles of yellow glass.

An Isomeric Modification of Sulphocyanide of Potassium. Fleischer. (*Deutsch. Chem. Gesell. Ber.*, iv. 190.) In the production of oxysulphide of carbon, according to the method of Thoms, a considerable quantity of persulphocyanic acid is formed. On treating this acid with an alcoholic solution of potash, the isomeric modification of potassic sulphocyanide is obtained. The author terms it isosulphocyanide of potassium. Its reactions with the heavy metals are greatly differing from those which the ordinary sulphocyanide gives with the same salts. With ferric chloride, for instance, it does not yield the well-known red colour, but a brown one, which, on shaking the mixture, disappears. Silver nitrate gives with the ordinary sulphocyanide a white precipitate, soluble in ammonia; the isosulphocyanide a yellow one, almost insoluble in ammonia. Chloride of mercury produces no precipitate with ordinary sulphocyanide, but yields a yellow precipitate with the isosulphocyanide. The isosulphocyanide is, however, transformed into ordinary sulphocyanide when submitted to fusion.

The Valuation of Cinchona Barks. P. Carles. (*Journ. Pharm.*, 4th series, xii., 81.) In this paper the author passes in re-

the different processes which have been recommended from time to time for determining the amount of alkaloid contained in cinchona bark, and then proceeds to describe a new method for this purpose which is as follows :—

An average sample of the bark is reduced to fine powder and passed through a sieve without residue. Twenty grammes are then taken and intimately mixed in a mortar with 8 grammes of slaked lime previously mixed with 35 grammes of water. This mixture spread on a plate, is dried in the air in summer, or on a water-bath at other times. When all the moisture has evaporated, the lumps are broken up, and the powder packed in a percolator with a piece of lint at the bottom. Chloroform is then passed through in successive portions till the mass is exhausted. This is ascertained by receiving the last drops in a watchglass, evaporating to dryness, and pouring on the residue water acidulated with sulphuric acid, then solution of chlorine, and lastly ammonia. When a green colour is no longer produced, it is known that all the quinine has been removed. When the operation is well conducted, about 150 grammes of chloroform suffice for this purpose. The menstruum retained by the mass is displaced by water, and the whole of the chloroform solution is either distilled or evaporated to dryness. To separate the alkaloids from the residue, it is treated several times in the cold with diluted sulphuric acid (1 to 10). 10 to 12 cubic centimetres are sufficient. This solution thrown upon a moistened filter passes through colourless, and free from resinous matter; it is raised to the boiling-point, and ammonia cautiously added, so as to leave the liquid with a *slightly acid* reaction. The sulphate of ammonia thus formed appears to prevent the mother-liquors from retaining sulphate of quinine in solution. All the quinine crystallises out in the state of sulphate. After some time it is collected on a double filter, the mother-liquors displaced by a little water, and the crystals dried and weighed. It is preferable to dry completely at 100° C., and after weighing in this state to add the 12 per cent. of water which is lost by this treatment. The other alkaloids retained in the mother-liquors are separated by precipitation. Their nature may be determined by ether.

This process has always yielded the author the best results. It is very rapid, because it permits an estimation to be made in a few hours. It is simple, because the quinine is at once obtained in the state of white sulphate, and the other alkaloids completely colourless. Lastly, it is very exact, as indicated by the following results :—

Yellow bark, A, powder obtained through a hair sieve, 20 grammes yielded—

- | | |
|--|-------|
| 1. By Rabourdin's process, cryst. sulphate of quinine, very coloured | 23-00 |
| 2. By Maitre's process, cryst. sulphate of quinine, yellow . . . | 22-30 |
| 3. By this process, cryst. sulphate of quinine, colourless . . . | 26-55 |

Yellow bark, B—

- | | |
|-------------------------------------|-------|
| 1. By Rabourdin's process | 29-50 |
| 2. By Maitre's process | 26-75 |
| 3. By this process | 31-25 |

With different species of cinchona the results were similar. The larger yield obtained by this process, the author considers is due to the more complete exhaustion of the bark. In each operation the treatment with chloroform was continued until no reaction of quinine was obtained.

A commission, composed of MM. Gobley, Roussin, and Jungfleisch, was appointed by the Société de Pharmacie to report on this process. They state that among the processes which have been published for the assay of cinchonas, may be distinguished those which give the total percentage of alkaloids without indicating their nature, and those which give the proportion of pure quinine. The first of these ought to be entirely abandoned. The methods generally employed for estimating the pure quinine are based on the employment of ether and chloroform for the separation of the quinine; in other words, they furnish as quinine all the alkaloid soluble in ether and chloroform. In this way grave errors may be incurred. It is evident, for example, that aricine being soluble in ether, a bark containing that alkaloid, and not quinine, would be regarded as of good quality. The insufficiency of these processes is further demonstrated by the fact that manufacturers of sulphate of quinine have abandoned their use. In the present day it is customary to employ for the analysis of commercial samples of bark, the same process which is used in the manufacture on a large scale. M. Carles' process is not subject to the objection attachable to the methods referred to, because the quinine is estimated in the state of crystallised sulphate, and consequently separated from all other alkaloids possessing a soluble sulphate. Moreover, the employment of chloroform as a solvent, and the elimination of a resinous matter by diluted sulphuric acid permits the sulphate of quinine to be obtained in a satisfactory state of purity and whiteness. Although the reporters do not con-

to M. Carles' process would be preferred by manufacturers, of opinion that for pharmacutists it is more exact than that used. They point out that different parts of this process have been previously suggested by other authors; but the judiciously combining them in the manner described is due to M. Carles. They regard as the most important objection to the new process, that the entire success depends on the manner with which the soluble sulphate of quinine is transformed into crystallised disulphate by the addition of ammonia. This requires considerable experience and manipulative skill. We regret that the author has not determined the proportion of ammonia which may remain dissolved in the mother-liquors.

Effect of Light and Air on the Alkaloids contained in Cinchona Bark. P. Carles. (*Journ. de Pharm.*, 4th series, xii., 161.) The author has conducted some experiments for the purpose of ascertaining what modification the quinine contained in cinchona bark undergoes by the pulverisation of the bark, and its prolonged exposure to light, heat, or moisture.

A sample of yellow bark was taken, and one-half reduced to an ultra-fine powder. This was divided into three portions:—one portion was excluded from light and air; the second was exposed to the sun's rays in a stoppered bottle during the whole month of August; the last was simply wrapped in paper and put in a dark place. At the end of a month the first sample had not changed, but the two others had become brown. The one in the dark absorbed more than 3 per cent. of water, and would no longer run out like fine dry powder. Exhausted with acidulated water, these two last powders furnished a highly-coloured liquid, which once revealed the alteration which the alkaloids had undergone. All the samples were then tested by the quinometric method of the author. Operating with 20 grammes of bark, 6 grammes of water, and about 150 grammes of chloroform, the following results were obtained:—

Yellow bark taken for the experiments furnished of crystallised quinine 31·25 per 1000 parts.

Powder sheltered from light and damp gave:—

	1st trial.	2nd trial.
Crystalline sulphate of quinine, rather yellow	30·1	30·5
Quinine precipitated from mother-liquor	10·75	10·85

Quinine exposed to the sun:—

Crystalline sulphate of quinine, yellow	26·3	25·6
Quinine precip. from mother-liquor	19·55	20·2

The sulphate crystallised with greater difficulty, and some resinoid matter was deposited.

The alkaloids in the powder exposed to damp were not determined exactly; but the results obtained indicated that the numbers would be similar to the last. The author is also making some experiments upon aqueous extracts obtained from the bark. The alteration of the alkaloid in this case appears to be more complete; but the details of these results will be published on a future occasion.

It appears from the author's investigation that the pulverisation of cinchona barks exercises very little influence on the alkaloids which they contain; while, on the other hand, heat, light, and moisture effect a considerable modification of the quinine.

Determinations of Alkaloids in Cinchona Bark. Dr. Hager. (*Pharm. Centralhalle*, 1871, pp. 201, 210, 225.) This is a repetition of an older process for the above purpose. The author considers the subject from two points of view: first from that of the chemist and druggist, and secondly from that of the quinine manufacturer. To the former he recommends the following method:—10 grms. of powdered cinchona bark are mixed in a porcelain pot with about 130 grms. of water, to which are added 20 drops of caustic potash lye, of about 1.3 spec. grav., and the whole is gently boiled for 15 minutes, with constant stirring. Then 15 grms. of dilute sulphuric acid (1.115 spec. grav.) are added to it, the boiling continued for 15 to 20 minutes, and the mixture left to cool. The liquid is then put into a cylindrical measure-glass, so much water added to it that the whole occupies a volume of 110 c.c., and now filtered through a filter whose diameter is from 10.5 to 11.0 centim. The filtrate is collected in another measure-glass, its volume (usually 60 c.c.) noted, and 50 c.c. of picric acid solution, saturated at ordinary temperature, added to it. The precipitate formed is left to settle for half-an-hour, then collected on a weighed filter, washed, and dried at 100°. Multiplying now the weight of the picrate with 0.425, the weight of the anhydrous alkaloids (quinine, quinidine, and cinchonine) is obtained. It hardly needs to be mentioned that the crust which forms above the margin of the liquid, in the boiling pot, has to be scratched away with a glass rod, and stirred into the liquid, etc. Dr. Van der Burg, who had to report for the Dutch Pharmacopœia, on the various methods for determining the amount of alkaloid in the cinchona bark, pronounced the above method an unsatisfactory one. Dr. Hager shows in his present communication, at great length, why Dr. Van der Burg had failed to obtain satisfactory results. The

reproduction of the detailed criticism would be of no interest. The method recommended to the quinine manufacturer consists in directly ascertaining and estimating the alkaloids, by adding alkali to the decoction of the bark, and shaking the alkaline liquid with petroleum-ether, which latter will take up the alkaloids.

The Application of Polarised Light to the Determination of the value of Cinchona Barks. Dr. E. J. de Vrij. (*Pharm. Journ.*, 3rd series, ii., 1.) The author writes as follows:—The strong deviation of the plane of polarization in different direction or different intensity of all the known cinchona alkaloids, induced me to try to apply this method to test the value of the cinchona barks; and, although I readily confess that my experiments in this direction are far from being complete, yet the results already obtained seem to me interesting enough to fix attention on this new method of investigation, so that their publication may, perhaps, afford some interest.

Before proceeding to the description of my method, it may, perhaps, not be superfluous to state the principles upon which it is based.

The molecular rotations of the cinchona alkaloids which are known with certainty are the following:—

Quinine:

in alcoholic solution $[\alpha]_D = 184^{\circ}35'$
 in acid solution . . $[\alpha]_D = 287^{\circ}16'$ } De Vrij and Alluard.

Quinidine:

in alcoholic solution $[\alpha]_D = 250^{\circ}75'$ Pasteur.
 in acid solution . . $[\alpha]_D$, not yet determined.

Cinchonine:

in alcoholic solution $[\alpha]_D$, not yet determined.
 in acid solution . . $[\alpha]_D = 190^{\circ}40'$ Bouchardat.

Cinchonidine:

in alcoholic solution $[\alpha]_D = 144^{\circ}61'$ Pasteur.
 in acid solution . . $[\alpha]_D$, not yet determined.

Besides these four alkaloids, about whose existence all chemists agree, and whose properties are well known, there exists in the cinchona barks still a fifth alkaloid, which is amorphous, soluble in ether, and whose compounds with acids are equally amorphous. I have long been uncertain if this alkaloid has an action on the plane of polarization, and it is only very recently that I became persuaded that it deviates from that plane slightly to the right. I have, however, not yet succeeded in determining the exact amount of this de-

viation, because this alkaloid is always yellow-coloured, and very difficult to obtain perfectly pure.

It is clear from the preceding that the different cinchona alkaloids possess a different rotation, and that some of them deviate the plane of polarization in an opposite direction. Therefore, in examining optically the combined alkaloids of any bark, three cases can occur:—

I. The alkaloids may prove inactive, viz., to exercise no deviation at all. This case, although not yet observed by me, may present itself, if the relative quantities of the alkaloids are such that their opposite deviations neutralize each other.

II. They are turned to the right (dextrogyre = ρ) if the quantity of quinidine, cinchonine, or amorphous alkaloid exceeds that of quinine or cinchonidine.

III. They are turned to the left (lævogyre = ρ) if the quantity of quinine or cinchonidine exceeds that of the other alkaloids.

From the facts mentioned, it appears that the deviation produced by quinine is different, depending on its being observed in solution in alcohol or in a diluted acid. It is very probable that this difference exists in the same direction with the other alkaloids, and its determination will be very desirable.

Taking now in consideration that, of the five mentioned alkaloids, two of them, viz., the quinine and the amorphous alkaloid, are very soluble in ether, whilst the three remaining alkaloids are sparingly soluble in this liquid; it follows that, if the alkaloids are treated with ether, the deviation exercised by the part insoluble in ether will prove to be very different from that observed before. This different deviation may be the following:—

(1.) No deviation, if the part insoluble in ether contains enough of cinchonidine to neutralize the opposite deviation of the cinchonine.*

(2.) Deviation to the right (dextrogyre) if the part insoluble in ether consists of cinchonine or quinidine, or both of them, or if their quantity is superior to that of the eventually present cinchonidine. The intensity of the deviation may throw some light upon this alternative.

* As quinidine deviates to the right like cinchonine, it can equally neutralize the deviation to the left of the cinchonidine. It is, however, very rare that cinchonidine and quinine occur in the same bark. Till now I have only found one example of this combined occurrence, viz., in the bark of the hybrid from *C. Calisaya* and *C. Pahudiana* (the so-called *C. Hasskarliana*, Miq.), in which bark I found the four alkaloids, together with the amorphous alkaloid soluble in ether.

(3.) Deviation to the left (lævogyre) if the part insoluble in ether consists either totally or chiefly of cinchonidine. In this case the intensity of the deviation will equally throw light upon the vernative.

The great difficulty with these observations consists in the difficulty to obtain solutions of the alkaloids which are not too much coloured. The first requisite to measure accurately the deviations is that the solution is colourless, and till now I have not yet succeeded in obtaining this desideratum, but have been obliged to be satisfied by obtaining solutions which had a slightly yellow colour. I obtained these solutions as follows:—After ascertaining the total amount of alkaloids in a bark, the alkaloids were dissolved in weak acetic acid, and to this solution I added a few drops of basic acetate of lead. After separating the lead by a current of sulphuretted hydrogen, the liquid, much discoloured by the precipitated sulphide of lead, was filtered, and the alkaloids precipitated by caustic soda. The precipitate being washed and dried, one may proceed to prepare a solution for the optical observation. The alkaloids are accurately weighed, and the determined weight called *p*. This quantity is dissolved in diluted sulphuric acid, and the volume of the solution accurately measured.* This volume is called *V*, and filtered immediately into the tube in which it will be observed. This tube has a length of 100 millimetres. After the tube has been completely filled and closed, and it has been ascertained that its contents are perfectly clear and transparent, it can be observed in the instrument.† If several different alkaloids are present in such quantities that their opposite deviations neutralize each other, the molecular rotation is = 0°, and this result needs only to be noted. If, however, a deviation is observed, this deviation is noted as α° = to the amount of degrees of deviation observed, either to the right or the left; for instance, = 3° \mathcal{R} , or $\alpha^\circ = 3^\circ \mathcal{L}$, etc. One has now the necessary data to calculate the molecular rotation = $[\alpha]_j$ of the mixed alkaloids by using the formula:—

$$[\alpha]_j = \frac{\alpha^\circ V}{p} \quad \mathcal{L} \text{ or } \mathcal{R} \quad \ddagger$$

Weight and measure are of the metric system.

The instrument used by me is the polaristrobometer, of Wild. It is, however, not, that any other good instrument may be used.

Although the sulphide of lead has a very favourable action in taking away a great part of the colour of the solution, its action is not the same with all kinds of alkaloids. I am therefore unable to state with certainty the quantity of alkaloids which must be dissolved in a certain volume. It is desirable to make a solution which contains 0.1 of the alkaloids. This is, however, in general not possible, because of too intense colour, wherefore the quantity of the alkaloids in the solution varies between 0.1 and 0.05.

After this determination, another part of the alkaloids is treated with ether, and the deviation of the part insoluble in ether determined in the same way. By these two determinations, one obtains two data, which, notwithstanding the still existing imperfections of the method, will prove to be of great utility in the investigation of cinchona barks, as may be seen by the following observations, made by Dr. B. Simpson and myself.

A. OBSERVATIONS BY DR. B. SIMPSON.*

1. *C. Calisaya*, from Java. Stem-bark.

Total amount of alkaloids 1.36 per cent. $[a]_D^{20} = 160.5^\circ$.
The alkaloids contained chiefly quinidine.

2. *C. Calisaya*, from Java. Bark from a branch.

Total amount of alkaloids 0.84 per cent. $[a]_D^{20} = 140.6^\circ$.
The alkaloids contained a large amount of quinidine.

3. *C. Pahudiana*, from Java. Root-bark.

Total amount of alkaloids 1.5 per cent. $[a]_D^{20} = 26.35^\circ$.

4. *C. succirubra*, from Darjeeling. Stem-bark of plants $3\frac{1}{2}$ years old.

Total amount of alkaloids 5.6 per cent. $[a]_D^{20} = 13.59^\circ$.
The alkaloids consisted of quinine, cinchonidine (both levogyre), cinchonine and amorphous alkaloid (both dextrogyre).

5. *C. succirubra*, from Ootacamund. Renewed bark (fourth harvest).

Total amount of alkaloids, 9 per cent. $[a]_D^{20} = 55.5^\circ$.

The part insoluble in ether proved $[a]_D^{20} = 19.8^\circ$.

The same alkaloids as in 4, but more cinchonidine and less cinchonine.

6. *C. officinalis* from Darjeeling. Stem-bark (one year covered by moss).

Total amount of alkaloids 7.68 per cent. $[a]_D^{20} = 56.35^\circ$.

The part insoluble in ether proved $[a]_D^{20} = 13.20^\circ$.

The same alkaloids as in 4 and 5, but much more quinine, of which the quantity amounted to 3.4 per cent.

7. *C. officinalis*, from Ootacamund. Renewed bark (second harvest).

Total amount of alkaloids, 8 per cent. $[a]_D^{20} = 139.49^\circ$.

The same alkaloids as in 6, but containing much more quinine; they were almost entirely soluble in ether.

* These observations have been made by Dr. B. Simpson, Surgeon of the Bengal Army, in my laboratory at the Hague, in February, 1870.

B.—OBSERVATIONS BY MYSELF.

1. *C. Calisaya*, from Darjeeling. Bark of trees three years old.
 Total amount of alkaloids, 3 per cent. $[a]_D^{20} = 120^{\circ}7 \text{ } \gamma$.
 The part insoluble in ether proved $[a]_D^{20} = 174^{\circ}34 \text{ } \gamma$.
 The alkaloids consisted of cinchonine, quinine, amorphous alkaloid, and cinchonidine.
2. *C. hybrida* from Darjeeling, probably from *C. Calisaya* and *C. officinalis*. Bark of trees three years old.
 Total amount of alkaloids, 3.24 per cent. $[a]_D^{20} = 178^{\circ} \text{ } \gamma$.
 The alkaloids consisted of quinine, cinchonidine, amorphous alkaloid, and very little cinchonine. The part insoluble in ether was too small for observation.
3. *C. succirubra* from Darjeeling. Stem-bark, sold in London in October, 1870.
 Total amount of alkaloids, 6 per cent. $[a]_D^{20} = 24^{\circ}1 \text{ } \gamma$.
 The alkaloids consisted of cinchonidine, cinchonine, amorphous alkaloid, and quinine.
4. *C. officinalis*, from Ceylon. Bark sold in London in November, 1870.
 Total amount of alkaloids 5.7 per cent. $[a]_D^{20} = 145^{\circ}8 \text{ } \gamma$.
 The part insoluble in ether proved $[a]_D^{20} = 91^{\circ}96 \text{ } \gamma$.
 The alkaloids consisted of quinine, cinchonidine, amorphous alkaloid, and cinchonine. The quantity of pure quinine amounted to 3.7 per cent.
5. *C. Calisaya*, from Java. Bark sold in April, 1870, at Amsterdam, under the name of "Java koningskina, No. 1."
 Total amount of alkaloids, 3.21 per cent. $[a]_D^{20} = 96^{\circ}3 \text{ } \gamma$.
 The alkaloids consisted of amorphous alkaloid, quinidine, cinchonine, and a trace of quinine.
6. *C. Calisaya hybrida*, from Java (*C. Hasskarliana*, Miq.). Bark sold in April, 1870, at Amsterdam, under the name of "Java koningskina, Nos. 2 and 3."
 Total amount of alkaloids 3.125 per cent. $[a]_D^{20} = 50^{\circ}2 \text{ } \gamma$.
 The alkaloids consisted of quinine, quinidine, cinchonine, cinchonidine, and amorphous alkaloid.
7. *C. Calisaya*, from Java. Bark sold in April, 1870, at Amsterdam, under the name of "Java koningskina, No. 4."
 Total amount of alkaloids, 2.47 per cent. $[a]_D^{20} = 20^{\circ} \text{ } \gamma$.
8. *C. Pahudiana*. Bark sold in April, 1870, at Amsterdam, under the name of "Bruine Javakina."
 Total amount of alkaloids, 1 per cent. $[a]_D^{20} = 188^{\circ} \text{ } \gamma$.

The alkaloids consisted of quinine, cinchonidine, and amorphous alkaloid, whilst the presence of cinchonine was dubious.

9. *C. Calisaya*, from Bolivia. Eastern Bolivian bark.

Total amount of alkaloids, 4 per cent. $[\alpha]_D^{20} = 138^\circ$

Notwithstanding the defects still adhering to the method, I feel certain that it will prove to be an important element in the examination and classification of the cinchona barks.

On an Alkaloid from Cinchona Bark hitherto undescribed. David Howard. (*Journ. Chem. Soc.*, 2nd series, ix., 61.) In experimenting upon impure crystallisations of quinine salts obtained from the mother-liquors of the manufacture of sulphate of quinine, the author has occasionally been perplexed by an unusual loss in recrystallising, which the mechanically adhering mother-liquor did not seem to account for.

A more careful examination of some of these substances, shows that the cause, in some cases at least, is the presence of an alkaloid hitherto undescribed. The extreme solubility of the salts of this base distinguishes it at once from the cinchona alkaloids already known, and renders it very difficult to separate from the uncrystallisable quinoidine.

The most convenient method of obtaining it is to purify the alkaloids contained in the mother-liquor from the recrystallisation of such impure products as have been mentioned by solution in ether, and after evaporation of the ether, to dissolve with oxalic acid in as small a quantity of water as possible, and allow it to crystallise.

The oxalate thus obtained may be purified by recrystallisation from water, with addition of animal charcoal, but the author has never been able to free it entirely from a yellow colour.

The most satisfactory salt for analysis is the platino-chloride, which is prepared in the usual manner; it is almost insoluble in water or in cold hydrochloric acid, but soluble with difficulty in hot strong acid; it forms a crystalline powder by precipitation, and well defined crystals by solution in acid.

The analysis shows that it is isomeric with the platino-chloride of quinine, but anhydrous, instead of containing one atom of water of crystallisation given off at 120° , as does the salt of quinine. The salt taken for analysis was precipitated from a hot acid solution, and was a distinctly crystalline powder. The composition is the same whether it be precipitated cold in a neutral solution, or crystallised from a strong acid solution.

The oxalate, though it is the most easily crystallised of the salts of this alkaloid, is unfortunately very difficult to purify entirely, and

so readily under the influence of air, light, or heat, that the substance has been unable to obtain its colourless state. When a dilute solution is concentrated by evaporation in a water-bath, a change of colour shows that decomposition has to a certain extent taken place, and on the addition of water a brown resinoid separates from the solution. To find out if this was caused by impurities or was a property of the salt itself, the platino-chloride of a high purity was decomposed by several processes, but in each case the resulting oxalate had the same colour and the same tendency to decompose.

When prepared from perfectly colourless solutions of the salt in ether, the oxalate was still of a greenish-yellow hue, even on the application of heat; in fact, this colour may be inherent in the salt itself.

Extremely soluble in water, the wet crystals melting at 100° , and less so in cold water; insoluble in ether, but very soluble in alcohol, and to a less degree in amylic alcohol, from hot concentrated solutions in either of which menstrua it crystallises freely on cooling.

The water of crystallisation is partially given off in vacuo, only at 100° after previous drying; if the salt is at once dried at 100° without previous exsiccation, it is apt to fuse.

Combustion proved exceedingly difficult; the usual process of heating in carbonic oxide was found inadmissible, the oxalate assuming a brown colour as soon as it touched the oxide. The only practicable method is burning in oxygen gas, and even in this mode of combustion at the low temperature at which the substance partially decomposes it is difficult to accomplish successfully. The results, agreeing very closely among themselves, differ considerably from the probable formula showing plainly the difficulty of obtaining a pure product.

Hydration and the oxalic acid point to the formula $2(C_{20}H_{24}N_2O_8, H_2O_4 + 9 aq.$ The water lost by drying in vacuo agrees very closely with 7 atoms, viz., 14.00 per cent.

It thus differs from oxalate of quinine by 3 atoms of water of hydration, the formula of the latter being $2(C_{20}H_{24}N_2O_8) + 6 aq.$ The properties of the other salts which were prepared are as follows:—The sulphate, tartrate, citrate, hydrochlorophosphate, and acetate are all exceedingly soluble in water; on drying in vacuo they form semi-crystalline masses, impossible to reduce to a state fit for analysis.

Hydrobromate and ferrocyanide obtained by double decomposition from oily strata at the bottom of the solution, soluble in an

additional quantity of water, but even on long standing they show no sign of crystallisation.

The hydriodate also forms an oily stratum in strong solutions, but on standing it becomes semi-solid by the formation of crystals; weaker solutions also deposit a small quantity of flocculent crystals, but in neither case can they be separated from the mother-liquor.

The sulphocyanide, while also forming an oil when in concentrated solutions, crystallises from a somewhat larger quantity of water, in long silky needles, almost white, very soluble, and readily decomposed by heat.

The iodo-sulphate the author has not as yet succeeded in forming. This is to be regretted on account of the great importance of this salt in the cinchona alkaloids, and further experiments are needed, either to form it or to prove its absence.

The alkaloid itself, as obtained by precipitation from a solution of its salts by potash or soda, is a yellowish oil. The author has not been able to obtain it pure in the solid state, for it will not bear heat without decomposition, and holds water too strongly to dry in vacuo. It is very soluble in alcohol, soluble to a large extent in ether, from which it separates as an oil when the ether is allowed to evaporate. It is a strong base; the salts are neutral to test paper; a small excess of the base strongly restores the colour of reddened litmus. Ammonia precipitates its solutions but imperfectly, and, if we may judge from this, it is even a stronger base than quinine.

Chlorine-water followed by ammonia produces in solutions of its salts the green colour and precipitate of dalleiochin which distinguishes quinine and quinidine. Strong acids, even in the cold, produce a change of colour, and even when diluted with a considerable quantity of water; heat renders the action much more rapid. This colouration is strongest when nitric acid is used, an excess of which, with the aid of heat, will develop a strong yellow-green colour, even in a weak solution. In this reaction, as well as in the persistent colour of the salts, this alkaloid shows a curious resemblance to aricine. The yellow-colour renders the examination of its optical properties difficult, but, as far as has been hitherto tried, it is inactive. The author was not able to recognise fluorescence in its solutions.

Its taste is a peculiar bitter, very much less, both in intensity and permanence, than that of other cinchona alkaloids. The author has not been able to find out whether this alkaloid is contained in all the species of cinchona, or, if not, to which it belongs, for the difficulty

of the crystallisation of the impure salts makes it a matter of uncertainty to obtain it.

Mr. J. E. Howard, when investigating the leaves of the *Cinchona Succirubra*, from India, found minute quantities of an alkaloid, soluble in ether, from which an alcoholic solution of oxalic acid precipitated it in a crystalline form; but the small quantities at his disposal prevented his examining it further than to show its analogy with quinine; his present conviction is that this substance is identical with the alkaloid now described, and though the evidence is not yet sufficient to enable them to speak with certainty, it tends strongly to prove it. It seemed so desirable to settle this point and to throw some light, if possible, on the order of formation, and possibly on the far more important and far more difficult question of the mode of formation of the alkaloids of the descending sap, that he has written to Mr. Broughton, and they hope shortly to receive a quantity of the leaves sufficient to enable them to investigate it.

On Paytine; an Alkaloid in the White Cinchona Bark from "Payta." By O. Hesse. (*Annal. der Chim. und Pharm.*, 1870.) In a specimen of the above bark the author found basic substances which proved to be wholly different from the ordinary cinchona alkaloids. The bark itself is not a real cinchona, as shown by its anatomical structure; it is perhaps identical with the quina blanca of *Mutis*. It consists like the latter of but one layer of bast, composed of greenish-yellow cells, between which a large quantity of white powder is deposited. Ammonia colours the bark greenish-yellow; hydrochloric acid dissolves the white floury powder and dyes the cells of the bast yellow. If to the acid solution an excess of ammonia is added, or a sufficient quantity of sodic acetate, a copious, white, flaky precipitate of oxalate of lime ensues. The filtrate, separated from this precipitate, produces with alcohol a white amorphous precipitate which dissolves in boiling water, the solution becoming pasty on cooling, and resembles in every respect a thick starch solution. The amount of starch the bark contains is very considerable. The alcoholic tincture of the bark contains a substance which gives with ferric chloride a dark blue solution and a similar precipitate, with lead acetate a yellow amorphous precipitate, but with gelatine solution nothing at all. When the alcoholic liquid is evaporated, the residue mixed with soda and shaken up with ether, the latter takes up the alkaloids as well as some colouring matters; by mixing the ethereal solution with some dilute oil of vitriol the alkaloids are separated from the colouring matters. The acid solution thus

obtained has a somewhat reddish tint, but is easily decolourised by treatment with animal charcoal. The colourless solution is then heated a little, and neutralised by ammonia, care being taken not to have the latter in excess, permitted to cool, and mixed with so much of a solution of potassic iodide that no more precipitate is formed. The white amorphous precipitate becomes very soon dense, crystalline, and yellow. After about 24 hours standing, when the separation of the new salt may be considered as completed, the mother-liquor is filtered off, and the precipitate mixed with sodic hydrate and extracted with ether. The ether solution, after having been washed a little with water, is left to spontaneous evaporation, when the new alkaloid separates in fine colourless crystals. Hesse gives it the name of "paytine." The figures obtained on analysis lead to the formula $C_{21}H_{24}N_2O$. Paytine fuses at $156^{\circ}C$.; on heating it to a higher degree an oily liquid distils over. It is a little soluble in caustic potash, in ammonia, and in water, but rapidly so in alcohol, ether, chloroform, and benzol. The alcoholic solution reddens blue litmus paper. The alkaloid has a bitter taste, but it does not seem to possess any properties acting with physiological effects; certainly, it is no poison, as experiments on a rabbit have proved. Remarkable are some of its colour reactions, so that paytine may easily be distinguished from the other alkaloids. Its hydrochlorate yields with platinum chloride a dark yellow precipitate which dissolves in hydrochloric acid to first a reddish brown, and then a blue solution. Chloride of gold produces in a solution of the hydrochlorate of paytine a purple colour and a similar precipitate; chloride of lime, carefully added to the acid solution, gives a dark red colour which soon turns blue, and finally pale-yellow, at the same time a white amorphous body separating from the solution. In concentrated nitric acid paytine dissolves with garnet red colour, which later becomes yellow.

The author then enumerates the various salts which paytine forms with acids. The hydrochlorate, $C_{21}H_{24}N_2O \cdot HCl$, forms colourless prisms soluble in 16.6 parts of water at $150^{\circ}C$.

The white cinchona bark above described contains a second alkaloid which is amorphous and cannot be precipitated by a solution of potassic iodide, but which in most respects is so much resembling paytine that it must be considered as amorphous paytine. Want of material prevented a closer study of this second alkaloid.

Paricine. By O. Hesse. (*Reports of the Berlin Chemical Society* 1870, No. 5, *Pharm. Journ.*, 3rd series, i., 344.) This alkaloid was discovered by Winckler, in 1845, in a sample of bark brought from

Pará, which, according to Howard, had been derived from *Cinchona lutea*, a tree which is called *lengua de vacca* (cow's tongue) in Huancoco, by reason of the rough feel of its leaves. Weidenbusch made an analysis of the alkaloid, which showed that its percentage composition was very similar to that of aricine, and, on this ground, Gerhardt asserted that it was merely amorphous aricine.

Subsequently Winckler, in studying *cortex chinæ palidæ* in 1865, took up the subject again, and compared paricine with beberine, because the latter has also the character of being precipitated from its solutions by nitric acid. Winckler found that these alkaloids had the greatest resemblance in their chemical behaviour towards the reagents he employed; and he was, therefore, of opinion that elementary analysis would prove them to be identical.

Upon this basis Flückiger assumes not only the identity of paricine and beberine,—buxin or pelosine,—but also conjectures that paricine probably exists in all kinds of cinchona bark. In order to separate it from the mixture of bases, Flückiger suggests that those bases should be converted into the sparingly soluble iodine compounds, and the paricine extracted by ether.

Hesse disclaims the intention of examining whether the method is suitable for detecting paricine or not, but rather seeks to show that the alkaloid in question does not exist in the kinds of cinchona bark used for making quinine. During the last eight years he has given attention to this matter, but has not succeeded in obtaining the smallest trace of paricine from those kinds of bark. In all instances the alkaloids readily soluble in ether, after separating quinine and cinchonine by means of tartaric acid, were submitted to examination by treating the sulphuric acid solution of these bases with concentrated nitric acid; but in no single instance was there any precipitation or turbidity caused thereby. If paricine had been present, however, it should have been found in this way.

The author adds, moreover, that paricine is not even identical with pelosine, since the latter, as Flückiger has observed, turns light towards the right, while pelosine is, according to De Vry, optically inactive.

The Precipitation of Quinia by Iodide of Potassium from Acid Solutions. J. M. Maisch: (*Amer. Journ. Pharm.*, xliii., 51.)

Some time ago the following prescription was received:—

R. Quiniæ Sulphatis	gr. xv.
Potassii Iodidi	ʒi.
Tinct. Ferri Chloridi	ʒi.
Aquæ	ʒiv.
Syrupi Zingib.	ʒi. M.

The quinia salt was dissolved in the tincture of iron, the potassium iodide in the water, and the solutions mixed; a brown precipitate was at once formed. The quinia salt was now dissolved in the water, with the addition of a little dilute sulphuric acid, the iodide added, and after solution had taken place, the tincture of iron; the same result was produced.

It was now supposed that the iodide might contain some iodate, that on the addition of an acid, iodine was liberated, which, with the excess of iodide, would form biniodide of potassium, and that the precipitation occurred in consequence of the presence of this compound. But when the solution of the iodide (Atkinson and Biggar's) was acidulated with muriatic acid, a reddish colour was not produced, nor would starch paste brought in contact with the liquid acquire a blue colour; iodic acid was therefore not present.

Righini stated (*Journ. de Chim. Méd.*, vol. xiii., p. 116) that bisulphate of quinia produces, with iodide of potassium, a red pulverulent precipitate.

A considerable quantity of iodide of potassium was dissolved in a solution of one part of sulphate of quinia in twenty of water, the solution of the latter salt having been effected with just enough dilute sulphuric acid. A white precipitate was the result, doubtless owing to the presence of some quinidia in the quinia salt; for a solution of one part of quinia sulphate in forty of water, effected with a sufficient quantity of sulphuric acid, remained clear on the addition of iodide of potassium in substance. When a considerable excess of pure sulphuric or muriatic acid was used for dissolving the quinia, the addition of solution of potassium iodide occasioned no turbidity or sediment; therefore the observation of Righini is not correct as far as it relates to neutral potassium iodide.

A solution of sulphate of quinia with just sufficient acid was prepared, iodide of potassium added, and then solution of citrate of iron; a white turbidity, with the gradual production of a bright red precipitate, was the result.

The same quinia solution was made, except that a considerable excess of dilute sulphuric acid was used; after the solution of iodide of potassium had been effected, every drop of the solution of iron citrate occasioned a brownish-white precipitate, which rapidly changed through various shades into deep brown. If the order of mixing was reversed, the potassium iodide yielded, with dilute sulphuric acid, a colourless solution, which became turbid, and turned brown with the iron citrate; and now yielded, with solution of quinia, a darker coloured precipitate, changing more readily.

of an aqueous solution, or the tincture of sesquichloride of iron, mixed with water so that the iron colour can scarcely be perceived, mixed with solution of potassium iodide, an iodine colour is at once produced, doubtless owing to the formation of ferric iodide: of the iodine in this compound being but loosely combined, we see in the mixture practically KI_3 , and obtain with it in quinia solutions the same precipitate which we observe on the addition of St. John's solution.

The appearance of the red or brown precipitate which, according to Bighini, contains quinia, hydriodic acid, and iodine, depends therefore on the presence of KI_3 ; or if KI be used, on the presence of some other compound producing the former.

The precipitate obtained in putting up the above prescription, after having been well washed with water, forms a brown powder emitting a slight odour of iodine, which is slowly evolved. When the precipitate is treated with ammonia, it changes to a dull cinchona colour; dissolved in acids, it yields a copious precipitate with hydrargyrate of potassium. Heated upon platinum foil, it decomposes, leaving a bulky charcoal, which is burned with difficulty without leaving any residue behind. The precipitate therefore contains, besides the elements of quinia, only iodine.

Cincho-quinine. W. T. Wenzell. (*Amer. Journ. Pharm.*, 1843.) The article sold on the American continent under the name is stated to represent all of the alkaloids naturally contained in Calisaya bark. It is put up in imitation of sulphate of quinine in ounce bottles. It appears in the form of white friable masses, which are almost tasteless, only a slight bitterness being perceptible. The result of the author's examination indicates that it is in reality only cinchonina, containing about 2 per cent. of cinchonidia and cinchonina. It does not contain quinia, quinidia, and cinchonidia, and therefore does not represent the whole of the active principles of the bark.

Hydrobromates of Quinine and Cinchonine. M. Latour. (*Journ. Pharm.*, 4th series, xii., 91.) The successful use of bromide of potassium in affections of the nervous system, and the association of this salt with sulphate of quinine, as well as other alkaloids, induced the author to prepare hydrobromate of quinine, in the belief that it might be useful as a medicine.

The hydrobromates of quinine and cinchonine were prepared by the double decomposition of bromide of potassium and the sulphates of the alkaloids, as follows:—

Neutral Hydrobromate of Quinine.

Basic Sulphate of Quinine	10	grams.
Alcohol of 85°	50	"
Bromide of Potassium	8	"
Distilled Water	20	"
Dilute Sulphuric Acid (1 per cent.)	10	"

The sulphate of quinine and the alcohol are heated together in a small flask; the solution of bromide, mixed with dilute sulphuric acid, is then added, and the whole heated to boiling. After a few minutes, the sulphate of potash is separated by filtration, and washed with hot alcohol. The filtration and washings are then evaporated to half the volume, and left to crystallise. After twenty-four hours an abundant crop of crystals was formed, and, when pressed between filter-paper, the salt was white, opaque, of a pearly appearance. The salt thus obtained is sufficiently pure for use, though it contains traces of sulphuric acid.

The proportion of bromide of potassium used must be rather more than equivalent to the sulphate of quinine, otherwise a mixture of basic and neutral hydrobromate is produced. It is also necessary to add sulphuric acid, in order to make the quinine sufficiently soluble, as well as to decompose a portion of the bromide of potassium, so as to produce hydrobromic acid, necessary for forming a neutral salt with the quinine.

Basic Hydrobromate of Quinine.—This salt was prepared in the same way, but only 5 grammes of bromide of potassium were used, together with 10 grammes of dilute sulphuric acid. A better plan is to dissolve 1 gramme of the neutral salt in 10 grammes of a mixture of alcohol and water in equal parts. This solution, heated to 70° C., is mixed with very dilute ammonia solution, until it acquires a slight alkaline reaction, and then mixed with a solution of 0.5 gramme neutral hydrobromate of quinine, shaking the whole until it becomes cold; a copious precipitate is then formed, consisting of basic hydrobromate.

The neutral salt is very soluble in water, soluble in almost all proportions in alcohol, and its reaction is acid. The basic salt is sensibly soluble in water, very soluble in alcohol, and its reaction is alkaline.

The hydrobromates of cinchonine are prepared in a similar manner. The neutral salt corresponds to the hydrochlorate; it is anhydrous, very soluble in water, and less soluble in alcohol than the corresponding salt of quinine. Its solution has an acid reaction.

a basic salt is sensibly soluble in water, very soluble in alcohol, its solution has an alkaline reaction.

Syrups of the Bromides of Quinine, Morphine, and Strychnine.

B. W. Richardson. At the meeting of the Medical Society, March 13, Dr. Richardson introduced the bromides of quinine, morphine, and strychnine as therapeutic agents.

He said that bromides were best administered in the form of *trips*, containing one grain of the bromide of quinine, one-eighth a grain of morphine, or one thirty-second part of a grain of bromide of strychnia in the drachm of each of the respective *trips*. Compounds of the syrups of the bromides of quinine and morphine, and of quinine, morphine, and strychnine were also useful. Each drachm of these the same proportion of dose was maintained. He had found the bromide of quinine of great service in bilious ulceration. Repeated doses of syrup of bromide of quinine and morphine in cases of neuralgia, and the syrup of quinine, morphine and strychnine, in a case of diabetes, had been signally successful. He believed the bromide of quinine to be the best preparation in cases of remittent or intermittent fever.

a Morphimetric Process for the Pharmacopœia. William A. Porter, jun. (*Amer. Journ. Pharm.*, xliii, 65.) The question "What is the best process for assaying opium to determine its pharmacopœia strength, suited for adoption into the United States Pharmacopœia?" was accepted by the writer at the Chicago meeting.

Reflection on the query suggests that it is not so much what is the best analytical process, as to decide what process is best suited for practical use by druggists and pharmacutists in determining the pharmacopœia value of opium for the purposes of the Pharmacopœia. Those who take the view that the process should embody the nicest and most refined manipulations of the analytical laboratory, may not adopt this view; but when it is understood that a large majority of persons needing its use are not analytical chemists, it is believed that simplicity, united to a fair degree of accuracy, is more available than extreme accuracy, beyond the reach of most apothecaries, and fitted in a complex process.

So many able chemists have published processes, some of which are well known in connection with their names, as Staples' process, Guillaumond's, etc., that the ground would appear to be well examined. The process of Staples is that of the United States Pharmacopœia. Its point is in the employment of alcohol to retain the colouring matter in solution during the precipitation of the morphia, and in mixing the ammoniacal precipitant also with

alcohol. The process of Mohr avails itself of the selective power of boiling lime-water to reject narcotina, and retain morphia solution. Both of these processes extract the opium with water. Guillermond's process employs alcohol of 71 per cent. to extract the opium, which is then precipitated by ammonia. The precipitate, as in Staples' process, contains narcotina.

One difficulty in extracting the portion of opium soluble in water is the caoutchoucoid matter which tends to resist its solvent action. The idea of employing benzine, or light coal oil to remove this, as well as the free narcotina, has been suggested by Albert E. Ebel for another purpose, and has been used by Dr. Flückiger in the examination of opium. It is believed that the preliminary use of this solvent in opium assays may be usefully adopted.

Believing that the best way to arrive at a solution of the question was to try several processes with the same solution of opium, a sample of nearly dry opium, weighing 300 grains, was triturated to coarse powder, and then rubbed with repeated portions of water until finely divided, and macerated in six times its weight of water for twelve hours, then percolated on a filter until the washings were nearly colourless. The united liquids (amounting to 4,500 grains) were divided into three equal portions, each representing 100 grains of opium.

No. 1. The solution was evaporated with moderate heat to half a fluid ounce, mixed with an equal bulk of alcohol (sp. gr. .83), filtered through a small filter, and the latter washed with a little diluted alcohol. Fifty minims of solution of ammonia (sp. gr. .94) was mixed with 2 fluid drachms of alcohol. One-half of this was added to the alcoholic solution of opium with agitation, and allowed to stand six hours, when the remainder of the ammonia was mixed in and the vessel permitted to rest for twenty-four hours. The crystalline matter deposited on the interior of the vial being detached, the contents were at intervals poured on a small tared filter, and the crude morphia washed, first with diluted alcohol and then with water, dried at 120°, and weighed. The product weighed 9.75 grains. This was treated several times with boiling neutral alcoholic ether, and the ethereal solution evaporated in a small tared capsule gave 0.31 grains of crystalline prisms, equivalent to 0.31 per cent. of narcotina, and 9.44 per cent. of morphia in the opium examined.

No. 2. This portion was treated with solution of subacetate of lead till it ceased to be precipitated; the precipitate separated on a filter and well washed, the filtrate treated with diluted sulphuric

acid by drops to separate the excess of lead as sulphate, and filtered. The clear solution by moderate heat is reduced to half a fluid ounce, mixed with its bulk of alcohol filtered, and the filtrate mixed with fifty grains of solution of ammonia containing alcohol, in two portions added half an hour apart, and allowed to stand twenty-four hours. The morphia was deposited in large distinct crystals, very few of which were attached to the interior of the vessel. They were collected on a filter, washed with diluted alcohol and water, dried, and weighed 8.75 grains. This, repeatedly boiled in ether, and the ethereal liquids evaporated, afforded but a trace of crystalline matter, too small to weigh and yet distinctly visible in minute prisms.

No. 3. This was mixed with sixty grains of lime, previously hydrated and boiled for fifteen minutes; the decoction filtered hot from the dregs, and these well washed with hot water. The filtrate slightly acidulated with muriatic acid was evaporated to half a fluid ounce, mixed with its bulk of alcohol, and filtered; and excess of alcoholic ammonia was added and mixed, and the vessel set aside for twenty-four hours. The coloured crystalline powder and the portion attached as a crust to the interior, were carefully collected on a filter, washed, dried and weighed, affording ten grains of impure morphia, more coloured than either of the other results.

The use of alcohol in this process is intended to retain the colouring matter, yet did not succeed in producing a light coloured morphia.

The last result, according to Mohr, should contain no narcotine, yet when boiled to exhaustion in ether deprived of alcohol, the ethereal liquid afforded 0.75 grain of narcotina, making the result of morphia 9.25 per cent., and narcotina 0.75 per cent.

It will appear, by a comparison of these results, that the Staples' process, whilst less complicated than either of the others, yields a purer product than the Mohr process, and a slightly larger yield of morphia; whilst the process No. 2, which is suggested by the writer, affords the purest and best crystallised morphia, but is more complicated than the others. Hence, it is the first, or Staples' process, that is to be preferred, modified by treating the powdered opium with warm benzine as a preliminary operation. The final success is greatly aided by conducting the evaporation of the liquor at a moderate temperature, which renders the product less contaminated with colouring matter. By reducing the bulk before precipitation to the extent noted above, the precipitation of the morphia is facilitated, whilst the crystals are equally light coloured.

By using benzine beforehand, the extraction of the opium will be more thoroughly accomplished.

Decomposition of Acetate of Morphia in Solution. J. M. Maisch. (*Amer. Journ. Pharm.*, xliii., 49.) A solution of acetate of morphia is very prone to change; it soon acquires a brownish-yellowish colour, and deposits a brown matter. A decomposition was already observed by E. Merck in 1837,* when experimenting about the best process for obtaining this salt dry, in a neutral condition; he states that the evaporation of its solution must be hastened at a low temperature by a current of air or other means, since it is decomposed at too slow an evaporation. But the nature of this decomposition is not stated.

Some months ago, Dr. Wm. T. Taylor, of Philadelphia, informed the author that he prefers to use a solution of this salt for hypodermic injection, and that he had repeatedly observed the separation in the liquid of one or more crystals, after keeping it on hand for some time. A careful examination of a crystal proved it to be pure morphia, entirely free from acetic or other acid; with nitric and iodic acids, and with sesquichloride of iron, it showed the reactions characteristic for morphia; it had an alkaline reaction to test papers, and neither acetic, carbonic, nor any mineral acid could be discovered by the appropriate tests; heated upon platinum foil it was consumed without leaving any residue.

The liquid had deposited a considerable quantity of a brown matter, and was of a pale brownish colour. It was neutral to test paper, but with pure sesquichloride of iron acquired a reddish tint, which disappeared on the addition of muriatic acid. Acidulated with nitric acid, iodohydrargyrate of potassium occasioned a turbidity. Evidently a minute portion of acetate of morphia remained still in solution.

The author exhibited a specimen which was originally a solution of 8 grains acetate of morphia in half an ounce of distilled water. By accident it had been set aside, and was lost sight of for several months. On examining it, the deposit and the change in colour of the solution mentioned before were observed, and a single crystal reaching from the surface of the liquid diagonally through the solution to the bottom of the vial on the opposite side.

The gradual decomposition of acetic acid in crude vinegar is well known, and it is possible that the changes noticed above are of the same or a similar nature.

It is also well known that a neutral solution of acetate of ammonia

* *Archiv. de Pharm.*, vol. xxiv., p. 46. Buchner's Repert., vol. lxiv., p. 265.

gradually deposits flocks, and that the liquid then assumes an alkaline reaction.

Note on Hydrocyanate of Morphia. By Professor J. M. Maisch. (*Amer. Journ. Pharm.*, xliii., 258.) Among the descriptions of morphia salts, as furnished by various chemists, the hydrocyanate is not enumerated. In Gmelin's "Chemistry" some double hydrocyanates are mentioned, but not the simple morphia salt; and nothing appears to be known of its formation or its properties.

A prescription having been received, calling for 1 grain each of acetate of morphia and cyanide of potassium in a 3-oz. mixture, the separation of needles was observed before the medicine was handed out; they were removed by straining, and found to be a salt of morphia. Although granulated cyanide of potassium was used, it was still possible that this salt might have been impure, and the formation of the crystals due to some impurity.

Pure hydrocyanic acid was therefore neutralised with ammonia, and the aqueous liquid diluted, so that it contained in each fluid drachm 1 grain of pure cyanide of ammonium. The solution was experimented with like the solution of cyanide of potassium. The following contains the results of the experiments thus far obtained:—

1. A neutral solution of a morphia salt, even if diluted to the proportion of 1 : 1500 (1 grain in 3½ oz.), yields with a neutral cyanide a crystalline precipitate consisting of hydrocyanate of morphia.
2. After the crystals have separated, the filtrate, acidulated with nitric acid, yields no precipitate with iodohydrargyrate of potassium; the morphia hydrocyanate, therefore, if soluble at all, dissolves but very sparingly in water.
3. The solubility of the morphia hydrocyanate appears not to be increased by an excess of the precipitant.
4. The precipitate is readily dissolved if the liquid is slightly acidulated by a mineral acid; it is likewise soluble in acetic acid, and for this reason does not appear in a mixture containing syrup of squill.
5. Hydrocyanic acid does not precipitate a neutral solution of morphia.

It is obvious from the foregoing that morphia salts ought not to be prescribed simultaneously with neutral cyanides, except enough acid be added to retain the hydrocyanate of morphia in solution.

New Alkaloids of Opium. O. Hesse. (*Ann. Chem. und Pharm.*, cliii., 47; and *Pharm. Journ.*, 3rd series, i., 205.)

The author has succeeded in extracting from opium several alkaloids. When an aqueous infusion of opium is precipitated with caustic soda or lime-water in excess, there remains in solution a substance which may be separated by ether. This substance gives with dilute sulphuric acid a purple colour like rheadine. This coloration was observed formerly by Merck, but he did not isolate the substance; what he described under the name of porphyrox being, according to the author, a mixture of several alkaloids which he has now separated by the following method.

The alkaline liquor is shaken with ether, and after acidulating the ethereal solution with acetic acid, the ether is evaporated off. What remains is mixed with a dilute alkaline solution gradually, and stirred meanwhile, so that the resin which separates may clot together. If this operation is properly conducted, the alkaloids remain in solution.

After twenty-four hours the precipitate is separated, the liquid mixed with slight excess of hydrochloric acid, and then with ammonia which precipitates the bases. The whole is then shaken with chloroform, the solution, thus obtained, acidulated with acetic acid, the chloroform driven off, and the residue neutralised with ammonia. This throws down a resinous reddish-coloured precipitate which becomes crystalline and consists of impure lanthopine. After twenty-four hours the filtered liquid is mixed with caustic soda, very little more than sufficient to decompose the ammonia salts present; it is then shaken with ether several times to separate the codeia which renders it turbid. This alkaloid is dissolved by ether more readily than the other bases—meconidine, codamine, laudanine, and another which the author designates *z*. Ether does not extract these latter from the solution containing fixed alkali until after chloride of ammonium has been mixed with it.

When the ethereal solution of these bases is allowed to evaporate very slowly, laudanine crystallises first, the other three bases remaining as an almost amorphous residue after the ether has evaporated. But if, before the ether has evaporated off entirely, the mother-liquor be mixed with solution of bicarbonate of soda, crystals of codamine are deposited on further evaporation of the ether.

The mother-liquor from which codamine has separated, is then mixed with acetic acid and with chloride of sodium, which precipitates chlorhydrate of meconidine, while the base *z* remains in solution. The latter is entirely separated from meconidine by repeatedly dissolving the hydrochlorate in water, shaking with bicarbonate of soda and ether, and then evaporating the ethereal solution.

Meconidine, as left on evaporation of an ethereal solution, is in a

form of a yellowish varnish. It melts at 58°C ., cannot be sublimed, dissolves in alcohol, ether, benzol, chloroform, and acetone. It blues litmus paper, is destitute of taste, but its salts are bitter.

A solution of a salt of meconidine gives with potash a flocculent precipitate soluble in excess of the precipitant. The solvents of meconidine do not extract it from this solution. A large excess of ammonia or of lime will also dissolve meconidine; but ether will separate it from these solutions. Strong acids decompose meconidine, especially with the aid of heat, producing a rose coloration that afterwards becomes purple. Acetic acid alters meconidine only when boiled with it, and then only partially. Concentrated sulphuric acid dissolves it with olive-green coloration.

Meconidine is distinguishable from rheadine by its solubility in potash and by its composition, $\text{C}_{21}\text{H}_{23}\text{NO}_4$, while rheadine is $\text{C}_n\text{H}_m\text{NO}_6$.

The salts of meconidine are very instable, the hydrochlorate and the hydriodate are amorphous, soluble in water and in alcohol. The chloraurate is a dirty yellow amorphous precipitate. The chloromercurate, white and amorphous; hydrochloric acid gives it a rose colour. The chloroplatinate $(\text{C}_{21}\text{H}_{23}\text{NO}_4\text{HCl})_2\text{PtCl}_4$ is an amorphous yellow precipitate.

Laudanine.—This base, crystallised from boiling dilute alcohol, forms colourless hexagonal prisms. It dissolves in benzol, chloroform, and in boiling alcohol; cold alcohol dissolves only $\frac{1}{100}$ th. It has an alkaline reaction.

The salts of laudanine are bitter. Potash and ammonia throw down from solutions a white precipitate soluble in excess of alkali. Chloroform extracts the base readily from its ammoniacal solution. Protochloride of iron colours the salts green, and dissolves them. Oil of vitriol dissolves them with an orange coloration, nitric acid with a rose colour, which becomes dark violet when heat is applied.

Laudanine has the formula $\text{C}_{20}\text{H}_{25}\text{NO}_3$; it melts at 163°C ., and does not sublime.

The hydrochlorate forms colourless prisms soluble in water and in alcohol.

The chloroplatinate is a yellow amorphous precipitate slightly soluble in boiling water. The chloromercurate is a white precipitate soluble in boiling water. The hydriodate is very soluble and crystallisable. The iodomercurate is a white amorphous precipitate, melting in boiling water and soluble; it is very soluble in alcohol. The sulphate crystallises in needles; the oxalate also crystallises, but is sparingly soluble in cold water.

Codamine, $C_{19}H_2NO_4$.—This base is purified by converting it into sulphate, decolorizing with charcoal, and shaking with ether after addition of ammonia. The base crystallises from ether or alcohol in hexagonal prisms terminated by pyramids. It is slightly soluble in water, more so in chloroform and in benzol. Its solutions are alkaline and destitute of taste. Generally the salts are amorphous and bitter. The base melts at $121^\circ C.$, then it decomposes, giving a beautiful crystalline sublimate.

Concentrated sulphuric acid produces a green coloration with codamine, nitric acid gives a bluish-green that becomes violet when heat is applied. Alkalies precipitate the base and an excess dissolves it; bicarbonate of soda also precipitates it in the form of white flocks, which aggregate into a resinous mass.

Lanthopine, $C_{23}H_{25}NO_4$.—This base is purified by treating the hydrochlorate solution with charcoal, precipitating the hydrochlorate with chlorate of sodium, decomposing that salt with ammonia, and crystallising from chloroform. The base then appears as a white powder, consisting of microscopic prisms scarcely soluble in alcohol, and very slightly soluble in benzol or in ether. It has no taste nor any alkaline reaction. It dissolves only in a large excess of acetic acid. It is precipitated from its solutions by potash, and dissolved by excess of potash. On the addition of chloride of ammonium to this solution the base is separated. This base gives no colour with chloride of iron, differing in this respect from morphia. Concentrated nitric acid transforms it into a red resin; sulphuric acid gives a violet coloration. Heated to $190^\circ C.$ the base becomes brown; it melts at 200° .

The hydrochlorate of lanthopine ($C_{23}H_{25}NO_4 \cdot HCl + 6H_2O$) forms a gelatinous mass composed of very small crystals, which aggregate together in drying to a horny mass that swells up in water, and finally dissolves. Boiling water dissolves the salt, setting free part of the base. The chloroplatinate forms a yellow crystalline powder insoluble in alcohol; it contains one equivalent of water. The hydriodate is gelatinous and soluble. The iodomercurate is soluble in boiling water and in alcohol. The sulphate forms very slender needles.

Thebaine.—This base, discovered by Thibouméry, is contained in the precipitate obtained in the manner described at the commencement of this article. That precipitate is dissolved by acetic acid, the solution decolorized with charcoal and then mixed with powdered tartaric acid; after twenty-four hours the crystals of tartrate of thebaine that have formed are collected and recrystallised from boiling

water. Then the base is set free and crystallised from alcohol. Pure thebaine has no taste; it melts at 193°C .

The acid tartrate forms slender prisms soluble in boiling water and boiling alcohol. The salt requires 130 parts of water at 20°C . for solution. The neutral salt is readily soluble in water and alcohol; it may be prepared by using excess of the base, and then separating it with ether.

The hydrochlorate requires 15.8 parts of water at 10°C . for solution; it is anhydrous at 100°C .

Thebenine.—This base is formed by an isomeric transformation of thebaine under the influence of boiling hydrochloric acid. A solution of 10 parts thebaine in 200 parts of hydrochloric acid (1.04 sp. gr.) is heated to boiling, and then diluted with an equal volume of water. Gradually crystals separate; these are washed with cold water, and redissolved in boiling water mixed with acetic acid; on cooling this solution fine crystals of hydrochlorate of thebenine separate as colourless laminæ that are soluble in boiling water or boiling alcohol, and in 100 parts of cold water. Nitric acid dissolves these crystals with a yellow coloration and evolution of nitrous fumes; the solution mixed with water gives a yellow amorphous precipitate soluble in ammonia. The hydrochlorate of thebenine ($\text{C}_{17}\text{H}_{21}\text{NO}_2 \cdot \text{HCl} + 3\text{H}_2\text{O}$) is bitter, but does not appear to be poisonous, while thebaine is extremely poisonous. The chloroplatinate is amorphous and yellow. The chloromercurate forms long colourless prisms. Sulphate of thebenine separates on adding sulphuric acid to a solution of hydrochlorate as a white crystalline powder, but slightly soluble in boiling water, insoluble in cold water or alcohol. It is anhydrous at 100°C .

Thebenine itself is amorphous, insoluble in ether or benzol, slightly soluble in boiling alcohol. It is insoluble in ammonia, but soluble in potash. It absorbs oxygen rapidly, and the potassic solution soon becomes brown in contact with atmospheric air. Sulphuric acid colours thebenine blue, while thebaine gives a dark red colour with the acid.

Thebaicine.—This is probably a second isomer of thebaine, formed by the action of strong acids and heat. Ammonia gives, after this treatment of thebaine, an amorphous yellow basic precipitate, insoluble in ether, benzol, water, or ammonia, slightly soluble in boiling alcohol, from which, however, it does not crystallise. Potash dissolves it, and the solution turns brown in contact with air. It dissolves with red colour in nitric acid, and with a blue colour in oil of vitriol. The sulphate is resinous, as well as the hydrochlorate.

The first precipitate contains also papaverine, and this base is present in the mother-liquor from which tartrate of thebaine has separated. It is precipitated with ammonia, and treated with a little alcohol, which renders it crystalline and dissolves an amorphous base. It is then converted into oxalate, which is crystallised from boiling water. The base may be considered pure if it dissolves without coloration in oil of vitriol. Papaverine crystallises in colourless prisms, soluble in 258 parts of cold ether; it crystallises from benzol and melts at 147° C. It dissolves in acetic acid without neutralising it; potash and ammonia separate it from this solution as a resinous mass that gradually becomes crystalline, but is insoluble in excess of the alkali. Nitric, sulphuric, or hydrochloric acid, added to the acetic solution, separates the corresponding salts in a crystalline form.

The author assigns to papaverine the formula $C_{21}H_{21}NO_4$, instead of $C_{20}H_{21}NO_4$ adopted by Merck and Anderson. This formula is confirmed by the analysis of the hydrochlorate and of the chloroplatinate. The former dissolves in 37 parts of water at 18° C., and the latter is a dark yellow crystalline precipitate. The chloromercurate forms colourless rhomboidal laminæ. The iodomercurate is crystalline and soluble in boiling alcohol.

The author concludes his memoir by stating the relations which the new bases bear to those previously known. The new bases exist in very small amounts in opium. A sample containing 8.3 per cent. of morphia gave 0.0058 per cent. of laudanine, the same quantity of lantopine, and 0.0033 of codamine.

Codamine and laudanine are homologues of morphia and of codeine. Lantopine is the superior homologue of papaverine. Related to the latter two, as oxidation derivatives, are cryptopine and narceine on the one hand, rheadine and rheagine on the other.

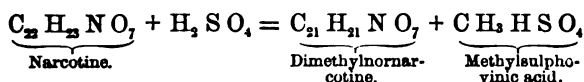
It has been stated incorrectly that cryptopine is soluble in potash. Oil of vitriol colours cryptopine dark green.

The Action of Sulphuric Acid on Narcotine and Codeine. H. C. G. Armstrong. (*Journ. Chem. Soc.*, 2nd series, ix., 56.) The author states that on heating narcotine with an excess of acid of the strength of equal volumes of ordinary concentrated sulphuric acid and water, in an open porcelain dish on a water-bath, it is observed that the colour of the mass gradually darkens, and that after a time, almost suddenly, the whole becomes of a dark pink colour. It is then thrown into a considerable quantity of warm water, in which it entirely dissolves, and a slight excess of ammonia is added, which throws down the base as an amorphous, almost white, precipitate. This was brought on a filter and washed with warm water. It was

found to be very easily soluble in alcohol, insoluble in carbonate of soda, readily soluble in potash, and when heated under water, to cake together in the form of a sticky semi-fluid mass. This behaviour at once suggested the probable nature of the base, viz., dimethylnarcotine, and analysis of the still further purified product proved this really to be the case.

The conversion of the narcotine was perfect, and if the reaction was arrested immediately on the appearance of the pink colour throughout the whole mass, an almost pure product was obtained.

The reaction takes place according to the following equation:—



The methylsulphovinic acid formed is again decomposed into sulphuric acid and methyl alcohol: for on adding baric carbonate in excess, filtering and evaporating to dryness, no baryta salt was obtained.

For the complete conversion of 50 grms. narcotine, it was necessary to heat between two and three hours. If the heating be continued beyond the above-mentioned point, a second atom of methyl can be removed, and probably a third; but a very impure product is obtained, sulphurous anhydride is given off, and partial carbonisation takes place.

On testing codeine in a similar manner, the author obtained a base isomeric with codeia; that is to say, having the same composition but different properties. Its characters are as follows:—The base falls down as a snow-white amorphous precipitate on the addition of sodic carbonate. Codeine is only precipitated after some time from concentrated solutions, and always crystalline. The hydrochlorate crystallises in groups of apparently hexagonal pyramids radiating from a common centre, and differs from the corresponding codeine hydrochlorate by losing both its molecules of water of crystallisation at 100°, whereas the former loses only $\frac{1}{2}$ at 100° the remaining $\frac{1}{2}$ only being expelled at 120°. The platinum salt is quite amorphous, and may be obtained anhydrous by drying at 100°; whereas the platinum salt of codeine is crystalline, and does not lose the whole of its water of crystallisation below 100°.

On the Wax of Opium. By O. Hesse. (*Berichte der Deutsch. Chem. Gesells.*, iii., 637.) The author has investigated the wax which is usually found in opium. The opium is extracted with water, the insoluble residues mixed with slacked lime (to eliminate

the colouring resins), and then treated with boiling alcohol. The alcoholic solution deposits on cooling a large quantity of white crystals. These crystals are affected with various basic substances, from which they can be freed by treatment with dilute hydrochloric acid and subsequent recrystallisation from boiling alcohol. The wax thus obtained is a mixture of several substances; to separate them boiling chloroform is employed, which dissolves the waxy matters, leaving behind colourless prismatic crystals, melting only above $200^{\circ}\text{C}.$, and probably related to lactucerin and hyocerin. The chloroform solution, when cooled down to $+10^{\circ}\text{C}.$, yields a substance appearing in colourless scales; and when the mother-liquor is cooled to $10^{\circ}\text{C}.$, a second substance, crystallising in minute prisms, is obtained. The first substance; separating out of the chloroform solution, is soluble in alcohol, ether, and acetone, is not attacked by cold concentrated sulphuric acid and caustic potash solution, fuses on the platinum foil, and volatilizes finally with formation of a heavy white smoke. Its fusing point is $82.5^{\circ}\text{C}.$ The numbers obtained in the elementary analysis led to the view that this substance is *cerotate of ceryl*. The second body deposited from the chloroform solution at $10^{\circ}\text{C}.$, is still more easily soluble in alcohol, etc., than the first-named substance. It fuses at $79^{\circ}\text{C}.$, and its analysis shows it to be *palmitate of ceryl*.

Contributions to the History of the Aconite Alkaloids. Dr. Th. Husemann, of Göttingen. (*Neu. Jahr. f. Pharm., and Pharm. Journ.*, 3rd series, i., 382.) The researches made by the author, in conjunction with Professor A. Husemann, on plant products, enable him in answering the question proposed by Flückiger to offer some additional remarks. In the first place he agrees that the name *pseudaconitina* ought to be retained, and he prefers it to *nepalina*, in which is involved a theory as to its origin. *Aconitina* is a body whose physiological action is better understood than its chemical relations.

The physiological actions of *pseudaconitina* and of *aconitina*, when applied externally, differ in this respect,—the former acts similarly to *veratria*, the latter not. Taken internally, *pseudaconitina* is given in much smaller doses than *aconitina*, and then often acts fatally. They both depress the action of the heart and lungs, and act similarly but unequally on the bowels.

Adelheim could perceive only a difference in strength between *aconitina* and *pseudaconitina*, derived from *Aconitum ferox*.

Keeping these distinctive characteristics in view, we may conclude

so long as aconitina has been used in Great Britain, pseudaconitina has most frequently been used in the place of it."

Rebull's aconitina was said by him to cause numbness and action, with a feeling of weight, lasting from two to twelve hours when applied externally. But soon after its introduction differences in the quality of the alkaloids were noticed; some being stronger than others, some dilating, some expanding the pupil. As early as 1854, Hilton and others were inquiring as to the kind of aconitina that could have produced effects on the skin similar to those of the real aconitina.

Rebull found that 6 milligrams exhibited by the stomach, or 5 milligrams subcutaneously, caused death in 11 minutes. The alkaloids made by T. & H. Smith from the leaves of *Aconitum napellus* were found to be identical with the real aconitina.

Rebull's experiments with Morson's aconitina show results very different from those of the real aconitina.

Rebull, using an alkaloid prepared by himself from *Aconitum napellus*, found 6 milligrams to kill a cat in 20 minutes.

Rebull's experiment as to the action of pseudaconitina on men is identical with one by Pereira, who found 15 milligrams to have a violent dangerous effect.

It is clear, then, that the English aconitina does differ from that of the German and Hesse. This is also proved by the want of activity as compared with the real aconitina, as evidenced by the German alkaloid.

The author is decidedly of opinion that pseudaconitina should not be regarded as a mere impurity, but as the real, active principle, for the Swiss aconitina has without cause been substituted. He thinks we ought to endeavour to introduce pseudaconitina as well as the real aconitina into the dispensary, and discover a method of preparing the real aconitina in a pure state, whereby we should be in a position to have a reliable preparation of real efficacy in the treatment of neuralgia.

In his own experience he states that rabbits have survived the administration of from 1 to 2 grains of German aconitina dissolved in water, and passed through the mouth; i.e., from twelve to twenty-four grains of the real aconitina as much as would be required of pseudaconitina. Others have had similar experiences.

We cannot admit that English aconitina owes its virtues to an impurity, but rather that pseudaconitina is the substance to which the English aconitina owes its reputation; in which case the term impurity would, of course, be inappropriate. Since 1864 even, two different aconite alkaloids were obtainable in the London market: the real aconitina, sold as pure aconitina; the other, pseudaconitina, of

presumed foreign manufacture, impure and useless. Of this fact both pharmacutists and doctors have more or less been aware for some time.

Probably the present state of the aconitina trade is occasioned by the scarcity of bikh root in the English market, from which we believe pseudaconitina is derived. Headland has stated that with great care pseudaconitina may be extracted from *Aconitum Napellum* in very small quantity. T. & H. Smith appear to have done this. The method adopted by Morson is not known, he having declined to give information thereupon, further than that his method is peculiar one. Perhaps after all his method depends on the selection of the roots operated on.

As regards the colour-tests of these alkaloids, Husemann remarks that, according to Adelheim, the colour reaction (phosphoric acid) is as well marked with pseudaconitina as well as with aconitina.

Great doubt still hangs over the various other alkaloids said have been derived from the genus *Aconitum*.

Buckheim and Lisenmenger seem to have established a distinction between nepellin and acolyctin, and have proved that nepellin and lycotonin are inferior in activity to aconitina.

On the Preparation and Composition of Hyoscyamine. Hoehn and E. Reichardt. (*Ann. Chem. Pharm.*, clvii., 98, *Journ. Chem. Soc.*, ix., 149, 1871.) The principal novelty the method of preparation consists in precipitating the impure alcoholic solution of sulphate of hyoscyamine with tannin. The tannin compound being not insoluble in alcohol, a certain quantity is found in the liquid in which the precipitation is effected. The authors recommend the removal of the fatty oil from the henbane seeds (in which it exists to the extent of 26 per cent.) by means of ether. They give 0.0453 per cent. as the amount of hyoscyamine in henbane seeds.

To the description of appearance and behaviour towards reagents already given by Geiger and Hesse, may be added the melting point, 90°, of hyoscyamine, its formation of precipitates with mercuric chloride, platinic chloride, and auric chloride; the gold precipitate appears to decompose after a time, with formation of hyoscinic acid.

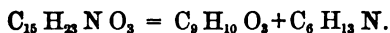
The alkaloid gave on analysis, as mean numbers, 67.6 C; 9.0 H; 5.1 N.: which lead to the formula $C_{15}H_{23}NO_3$. The *hydrochloride*, *platinochloride*, and *sulphate*, were analysed, with results expressed by the formulæ $C_{15}H_{23}NO_3 \cdot HCl + 2H_2O$; $2(C_{15}H_{23}NO_3 \cdot HCl) \cdot PtCl_4$; and $2(C_{15}H_{23}NO_3) \cdot H_2SO_4 + 2H_2O$, respectively.

By boiling for several hours with saturated solution of baryta,

hyoscyamine breaks up into an acid and an amine, called by the authors hyoscinic acid and hyoscine. Hyoscinic acid is described as crystallising in long glistening needles, which melt at 104° – 105° , and smell something like benzoic acid. The acid gave on analysis 65.1 per cent. C, 6.45 per cent. H; its barium salt, 30.3 per cent. Ba O, and 3.25 per cent. H_2O ; results expressed by $Ba(C_9H_7O_2)_2 + 2H_2O$. Phloric acid is an isomer of hyoscyamic acid, but appears to be bibasic, and does not melt below 128° to 130° C. Hyoscinic acid appears rather to resemble atropic acid, $C_{18}H_{15}O_4$, obtained by Krant in an analogous manner from atropine.

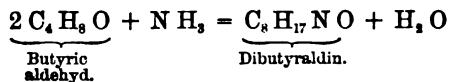
Hyoscine was obtained as an oily liquid, of strongly alkaline reaction, which crystallised by standing over sulphuric acid. As the whole quantity obtained did not exceed 0.3 gram., little was done beyond analysing the chloride and platino-chloride. $C H_{14} N Cl$, and $2(C_8H_{13}N, H Cl) Pt Cl_4$ express the composition of these substances, giving for hyoscine the formula $C H_{13} N$.

The breaking up of hyoscyamine may be represented thus:—

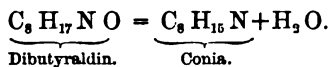


In an actual experiment 0.9 gram. hyoscyamine gave, when boiled with baryta, about 0.5 gram. acid, and 0.3 gram. of base. The above equation would require 0.56 gram. and 0.34 gram. respectively.

Synthesis of Conia. H. Schiff. (*Deutsch. Chem. Gesel. Ber.*, iii., 946.) This is the first case of the artificial formation of a vegetable alkaloid. The author has found an organic base, which proves to be identical with conia, the alkaloid of hemlock, among the products of the dry distillation of dibutyraldin; a body resulting from the action of an alcoholic solution of ammonia on butyric aldehyd.



The conia is found among the final products of the dry distillation of the dibutyraldin:—



This artificially formed conia produces all the characteristic physiological effects of the natural alkaloid.

Cytisin. (*Pharm. Journ.*, series 3, i., 682.) An article, by Dr. William

Marmé, "On the Action and Production of Cytisin," appears in a recent number of the "Transactions of the Academy of Göttingen." Cytisin was first separated by the writer, in conjunction with Professor Aug. Husemann, from the unripe pods and ripe seeds of *Cytisus laburnum*, Linn., as a strongly alkaline vegetable-base, easily crystallisable, and forming single and double salts, readily soluble in water and alcohol, but not in ether. The following observations supplement those already published in the *Zeitschrift für Chemie*, viii. p. 161, and Husemann's *Neues Jahrbuch für Pharmacie*, xxxi., pp. 1-21.

1. *Action of Cytisin upon Animals.*—The poisonous action of cytisin, the pure alkali as well as the very easily crystallisable nitric salt, extends to animals of every type. This was established by experiments on animals belonging to the various classes of Protozoa, Coelenterata, Echinodermata, Vermes, Crustacea, Arachnoidea, Myriapoda, Insecta, Mollusca, Pisces, Amphibia, Reptilia, Aves, and Mammalia. The poisonous action takes effect by application to all parts of the system, except the outer skin. A very small dose is fatal to all the higher animals. For frogs a dose of .002-.004 gramme was sufficient; for young pigeons, .003 gr.; for owls, .001 gr.; for jays, .0015 gr.; for cats, .03-.05 gr.; for dogs, .06-.1 gr.; for rabbits, .05-.08 gr.; and for kids, .3-.4 gr., by subcutaneous application; or by injection, for cats, .015 gr.; for dogs, .025-.05 gr.; and for rabbits .01-.015 gr. of cytisin nitrate. Usually the poison acts in the first place by exciting; the excitation soon passing away, and giving place to a depression or complete paralysis, with a rapidity in proportion to the amount of the dose. The function of the cerebrum is not directly affected; no narcotic action, properly speaking, is exhibited with the lower animals. The spinal cord and the motor nerves are at first excited, and are or less complete paralysis following, which commences in the peripheric ends of the motor nerves. The voluntary muscles may be completely excited by an induction-current after entire paralysis of their motor nerves, and even when direct mechanical and chemical irritation produces no contraction. The sensible nerves are injured in their action only very late by cytisin. A change in the respiration is, with all the higher animals, one of the first symptoms of poisoning by cytisin. It is at first accelerated, then becomes retarded, and is finally completely suspended by paralysis of the nerves. The vaso-motor system of nerves is excited by cytisin. The ganglionic central-organ, which lies in the heart and occasions its contraction, is at first excited, and then becomes weaker and

possibly paralysed. With dogs, cats, and rabbits, and generally also with birds, salivation arises during the poisoning. With birds, and many mammalia, cytisin occasions vomiting by all modes of application. It excites, both after introduction into the stomach and intestines, as well as after subcutaneous application, increased, often powerful, peristaltic action. In no mode of application does cytisin exercise any constant action on the pupil. The temperature of the body is only slightly increased, quite at the commencement of the poisoning, but sinks steadily till death. The elimination of the cytisin introduced into the body takes place especially through the nerves, unless by vomiting. Recovery from poisoning by cytisin can generally be effected when it is possible to maintain the respiration for a sufficient length of time. Death is always the result of asphyxia. The exact chemical proof of poisoning by cytisin is extremely difficult. Comparative experiments with aqueous and alcoholic extracts of the seeds, ripe and unripe pods, flowers, leaves, bark, and roots, prove the poisonous nature of all these parts, and that cytisin is the sole poisonous agent in them.

2. *The Occurrence of Cytisin.*—The supposed laburnin acid of Mr. Scott Gray, is a mixture of inorganic and organic acids. The poisonous properties observed by him were due to the presence of a small quantity of cytisin, and the alleged narcotic action is altogether erroneous. Cytisin is also present in the black seed-pod. About 500 grammes of the separated pods were found to contain a proportionately large amount of cytisin. The fat oil extracted from the seeds by ether, of a clear yellow colour and agreeable flavour, is not poisonous. Cytisin had been already found by the writer and Professor Husemann in three other species besides *Cytisus laburnum*, viz., *C. alpinus*, *supinus*, and *elongatus*. During the previous year, the writer had examined, in reference to the presence in them of cytisin, and their poisonous properties, several other species. *C. Weldenii*, *sessilifolius*, *capitatus*, and *hirsutus* gave positive results, both by chemical analysis and experimenting on frogs. With *C. nigricans*, on the other hand, no poisonous substance could be obtained from the pods, seeds, or bark. This circumstance is of special interest, since this species is separated by English botanists, following Griesbach, into a distinct subgenus. Of the three subgenera of Griesbach, *Laburnum*, *Eucytisus*, and *Lembotropis*, the first (including *C. laburnum*, *fragrans*, and *sessilifolius*) and the second (including *C. capitatus*, *supinus*, *elongatus*, and *hirsutus*) are poisonous; while the third, including *C. nigricans*, appears to be

harmless. Dr. Marmé promises a further contribution, with reference to the poisonous effects of cytisin on the human body.

(The preparation and properties of cytisin were described in the "Year Book of Pharmacy," 1870, p. 122.)

Acridine, a new Alkaloid. Gräbe and Caro. (*Ann. Chem. Pharm.*, 159.) The authors have discovered an interesting volatile alkaloid, of the formula $C_{13}H_9N$, accompanying crude anthracene. It is prepared by boiling the crude anthracene, before it has been treated with solvents, in dilute sulphuric acid, and adding bichromate of potash to the filtered solution. An almost insoluble precipitate at once forms. This may be dissolved in a large quantity of boiling water and by several crystallisations is obtained in beautiful orange-yellow needles, from which ammonia liberates the new base. The authors have named this substance acridine on account of its irritating and acrid qualities. It acts energetically, even in very dilute solution on the sensitive parts of the skin and on the mucous membrane. Its powder inspired even in the smallest quantity, causes sneezing. Pure acridine is colourless, crystallises in plates, volatilizes in aqueous vapour, melts and begins to sublime in plates at 107° , and distils unchanged at 360° . It is readily soluble in alcohol and ether. The salts of acridine are all yellow, although the pure base is colourless; they crystallise very readily.

Very dilute solutions appearing colourless by transmitted light exhibit a magnificent blue colour by reflected light, which passes into green the more concentrated the solution is made, and finally appears almost completely, when the solution is of a deep yellow colour by transmitted light.

Arbutin from Uva Ursi. J. Jungmann. (*Amer. Jour. Pharm.*, xliii., 202.) The following is an account of the author's experiments on the extraction of *arbutin*, taken from a long and elaborate essay on the Chemistry of the Bearberry:—

A quantity of coarsely powdered uva ursi leaves was exhausted with cold water by percolation, the infusion heated to the boiling point, strained, and a greenish flocculent coagulum of albumen was retained on the strainer; the infusion, after having been more concentrated, was treated with freshly prepared hydrated oxide of lead, until it would no longer produce a precipitate; this was separated by filtration. The filtrate, still more concentrated by evaporation, was divided into two parts: the first was set aside in a warm place to evaporate spontaneously; the second was treated with strong alcohol; this produced a bulky precipitate of gummy matter, which was removed by filtration. The alcoholic filtrate was again divided

into two portions: the first set aside to evaporate spontaneously, the second evaporated to a syrup and then treated with ether; the different ethereal solutions were mixed and evaporated at common temperature. The residue consisted of a mass of nearly colourless prismatic crystals of considerable size, of a bitter slightly acrid taste, with a small quantity of resinous matter of peculiarly disagreeable odour adhering, ericolin.

They could be easily purified by either washing them with ether, which would dissolve out the resin, or else by dissolving them in a small quantity of boiling water, filtering and recrystallising; thus purified from water they were inodorous, not near as large, but small needles having a silky lustre.

The alcoholic solution yielded a dark coloured extract nearly black. This was redissolved in alcohol and treated with animal charcoal, filtered, and again evaporated spontaneously; it yielded, after being pressed and dried, yellowish white crystals of flocculent character having no odour.

The aqueous solution, which had been set aside in a warm place was found, after about two weeks' standing, to consist of a soft extractive mass, covered all over the surface with small white crystals, very difficult to remove on account of the large amount of black gummy extractive adhering to it. The crystals contained in this mass could only be obtained after long and repeated treatment with animal charcoal; to remove colouring matter and other impurities, it might be purified by precipitating the colouring matter by a solution of *alum*, but this mode of proceeding can only be recommended when *arbutin* is the only object in view, otherwise it is objectionable, as it complicates the process. A quicker way, however, to obtain the crystals, was found to be by treating the extractive mixture with a mixture of alcohol and ether, in which they readily dissolve, leaving behind nearly all the impurities; as, thus obtained, the crystals have, in their moist condition, a yellowish colour, becoming nearly white when dried; they possessed the same properties as those obtained previously.

All the crystals obtained by these different processes proved to be *arbutin*, the discovery of which was first announced by Kavalier in 1852.

A second quantity of leaves was reduced to a coarse powder, decocted with water, the decoction strained and precipitated with neutral acetate of lead; the precipitated lead salt was filtered off and the filtrate was treated with basic acetate of lead until a precipitate was no longer produced, this being filtered out. Sulphuret-

ted hydrogen gas was passed in the filtrate until all the lead was precipitated; the sulphuret of lead was then removed by a filter, and the excess of hydrosulphuric acid by heating the filtrate; this was evaporated to a soft extract, redissolved in water, treated with animal charcoal, then again filtered and evaporated and, while hot, set aside. After about 24 hours' standing the bottom of the vessel was covered with bunches of small crystalline needles of arbutin; these were pressed and dried between filtering paper, and purified by redissolving them in a small quantity of boiling water, and again allowing the crystals to separate; these when pressed and dried, consisted of small prismatic needles having a silvery lustre. This second process for obtaining the arbutin is in the main points the original one of Kawalier, except that he does not precipitate with *basic* acetate of lead, which, however, removes nearly all the gum and colouring matter, and thereby facilitates the crystallisation to some extent.

Arbutin generally crystallises from ether in prismatic needles of considerable size and perfectly colourless; from an alcoholic solution, in small acicular crystals of a white colour; and in small bunches of needles from water; it is neutral in its behaviour, very soluble in warm or hot water, less in cold water or alcohol, more in hot alcohol, very sparingly in ether; a concentrated solution of arbutin is precipitated by strong alcohol or ether added to it, but the precipitate rapidly disappears on shaking. Concentrated sulphuric acid or hydrochloric acid added to the crystals on a small plate, gradually dissolves them without change of colour. With nitric acid the crystals first turned black, and then slowly dissolved, the acid assuming a yellow colour and giving off fumes of nitrous acid. Arbutin in aqueous solution does not affect an alkaline solution of sulphate of copper; the salts of lead, acetate and subacetate, do not precipitate it; salts of iron have no effect upon it; other reagents for organic bodies, as tannic and gallic acid, bichloride of mercury, nitrate of silver, iodide of potassium, and bichloride of platinum were tried without any results.

While experimenting with these reagents, the author accidentally found a very characteristic and remarkable test for arbutin; when a solution of arbutin in water is rendered alkaline by ammonia, or any other caustic or carbonated alkali, and then phosphomolybdic acid is added, a blue colour is produced; in strong solutions the colouration is of a deep azure blue, but the bluish hue can be observed even in very dilute solutions. One grain of arbutin was distinctly indicated in twenty pints of water (1 in 140,000); this

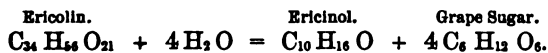
tion does not occur with molybdate of ammonia, nor does it take place when phosphoric or phosphomolybdic acid is acted upon an alkali alone.

A solution of arbutin may be perfectly colourless but still impure. When to an impure solution of arbutin, ammonia or any caustic or carbonated alkali is added, a deeper sometimes orange colour is produced, while a solution of pure arbutin is not affected in this way.

In 1847, Mr. E. C. Hughes described (*Amer. Journ. Pharm.*, 47) a crystalline principle obtained from uva ursi which he named *ursin*; this the author shows to be impure arbutin. He also describes the composition and glucoside nature of arbutin, and the mode of obtaining hydrokinone, which is the product of its splitting up.

Arbutin has also been found abundantly in *Chimaphila umbellata*, and it probably exists in a number of ericaceous plants. Its medicinal properties have never been practically applied. It was at one time believed to represent the diuretic properties of uva ursi, and Hughes states that one grain of his ursin proved a powerful diuretic. The celebrated pharmacologist, Dr. Schroff, of Vienna, who experimented with pure arbutin, states, however, that it possesses no diuretic properties at all; he gave it in doses as high as eight grains, and could not detect it in the urine.

When the mother-liquor from arbutin is heated with a dilute acid (sulphuric or muriatic) a resinous body separates, which has received the name of ericolin. This again is a glucoside, which, when treated with a dilute acid, splits into grape-sugar, and an odorous substance having the character of a volatile oil, ericinol; both have been noticed already by Kavalier in his investigation. In preparing ericolin from the mother-liquor of arbutin, the author found that a portion of ericolin is decomposed as soon as it forms into ericinol, giving rise to the strong disagreeable odour of the latter. Ericolin is a dark-brown resin, becoming somewhat lighter when dried and rubbed to powder; its chemical composition is $C_{34}H_{46}O_{21}$. Its decomposition into ericinol is shown by the following:—



Ursin, another principle described by Trommsdorff (*Amer. Journ. Pharm.*, 1854), and obtained from an ethereal tincture of the leaves previously exhausted with water, was prepared by the author in the following way:—The leaves after exhaustion by water are per-

colated with strong alcohol; the dark-green tincture deposits already on standing a large quantity of nearly white urson, which only needs recrystallising; the remainder of the tincture is evaporated, treated with water, and then washed with ether and recrystallised from alcohol. Urson, when pure, possesses neither odour nor taste; it is insoluble in water, sparingly soluble in alcohol and ether. It is not affected by alkalies or dilute acids.

Concentrated sulphuric acid turns it black and gradually carbonises it, the acid assuming a red colour. Concentrated nitric acid turns it yellow, gradually dissolving it, giving off nitrous acid. When heated, urson melts into an amorphous transparent mass; at a still higher temperature it boils and sublimes in a test-tube unchanged. Its medical properties have as yet not been ascertained, at least no physiological experiments have been made with it, and very probably it is entirely inert. A small quantity of *volatile oil* was found in the aqueous solution of the ethereal extract, besides some tannic and gallic acids.

The organic constituents of *uva ursi* as obtained by this investigation, therefore, are—arbutin, and its product of decomposition, hydrokinone; ericolin, ericinol, urson; (ursin, the diuretic principle of Hughes, was found to be impure arbutin;) tannic, gallic, and malic acids; then a small quantity of volatile oil, fatty matter, wax, gum, sugar, albumen, colouring matter, etc.

The test for arbutin may perhaps serve for finding this principle in plants, without isolating it; for an infusion of *uva ursi*, when diluted with sufficient water to make it perfectly colourless, and then rendered alkaline, produces, on the addition of phosphomolybdic acid, the blue reaction due to arbutin; when the alkali (ammonia) is added to the diluted colourless infusion, a colour (orange) again appears, owing to the astringent acids present; this colour must also be removed by again diluting it with water, before the final addition of the phosphomolybdic acid.

This test cannot be applied to a strong infusion, because phosphomolybdic acid reacts with tannic and gallic acids green, and the blue colour cannot then be observed.

On Agoniada and Agonidine. Dr. P. Peckold. (*Chem. News*, xxii., 84.) The author has extracted from the *agonia bark* (*Plumeria lancifolia*, a tree indigenous to the Brazils, the bark being largely used in that country as febrifuge.) a substance which he calls agonidine, a crystalline matter, devoid of smell, of a very bitter taste, difficultly soluble in ether, but more readily so in boiling alcohol and boiling water; does not sublime on being heated; is soluble

also in solution of caustic potassa, in ammonia, and in concentrated sulphuric acid; the latter solution is at first of a golden-yellow colour, but turns gradually green. Upon the addition of nitric acid to the sulphuric acid solution of agonidine, a yellow-coloured flocculent matter is separated; this substance is a glucoside identical with arbutine, and contains no nitrogen. The formula of agonidine is $C_{10}H_{14}O_4$.

Muscarin, the Alkaloid of the Fly Fungus. Koppe and Schmiedeberg. (*Wittstein's "Vierteljahresschrift,"* bd. xiv., heft 2, 1870). The authors have extracted an alkaloid from the fly fungus (*Amanita muscaria*), and have given to it the name of muscarin. The process of preparation is very complicated and tedious, including the pressing out of the juice of the fungus, subsequent concentration by evaporation, and precipitation by means of alcohol. The alcoholic solution is evaporated, and then purified by means of sugar of lead and ammonia, which remove some insoluble matter from it; it is then dried up with powdered glass. From the dry mass a tincture in absolute alcohol is made. The evaporation and precipitation by means of ammonia and acetate of lead is repeated. The lead is subsequently removed by means of dilute sulphuric acid. To the sulphate of the new alkaloid there is added the double iodide of potassium and mercury, which throws down a precipitate containing the alkaloid in question. From this precipitate it is to be extracted by means of baryta-water, etc.

Muscarin forms a crystalline mass, which is very deliquescent, fusing to a syrup on exposure to the air. It is tasteless and odourless; reacts strongly alkaline; is insoluble in ether, little soluble in chloroform, very soluble in alcohol and ether. When exposed to the action of heat, it first becomes brownish (at $80^{\circ}C.$), and at $100^{\circ}C.$ is a solid, but fuses at higher temperatures; strongly heated, it evolves a smell of tobacco, and burns. It is not alterable by boiling with weak solution of potash or dilute sulphuric acid. Heated with solid potash, it evolves a smell of fish; and, on further treatment, disengages abundance of ammonia.

It is a powerful base, precipitating oxides of iron and of copper from their solutions in acids. With carbonic acid, it yields a tolerably stable carbonate; and, with sulphuric acid, it gives a crystalline salt, which is deliquescent.

Tannic acid precipitates it only from concentrated solutions; picric acid, chloride of platinum, and ferrocyanide of potassium give no precipitate.

The toxic effects of muscarin resemble those of the Calabar bean.

Alkaloids in Plants of the Family of the Boraginæ. (*Phar Centralhalle*, 1871, p. 111.) Diedälin's statement that the extract of *Cynoglossum offic. L.* produces effects similar to those of the American arrow poison, curare, caused Prof. Buchheim to investigate whether other plants of the boraginæ contained any alkaloids. Prof. Buchheim extracted for this purpose, with water, spirit of wine, and absolute alcohol; and he detected, by means of tannin, phosphomolybdic acid, and phospho-wolframic acid, traces of alkaloids in the extracts of *Anchusa offic. L.*, *Lycopsis arvensis L.*, *Symphytum off. L.*, *Pulmonaria offic. L.*, *Lythospermum arvense L.*, *Myosotis palustris L.*, *Myosotis stricta L.*, and *Ehium vulgare L.* Only the extracts of *Anchusa off.* and of *Ehium vulg.* produced, when applied to frogs, feeble phenomena of curare poisoning; the extracts of the other plants gave only pains at the spots of application. The alkaloid could not be isolated by means of tannin or of phosphomolybdic acid; and, according to the method of Stas, only an impure, amorphous, hygroscopic substance of alkaline reaction could be obtained.

On Sanguinarin. By H. Nasehold. (*Journ. pr. Chim.*, cvi., 385) The author extracted the finely-powdered root of *Sanguinaria Can.* by 8 to 10 times repeated treatment with alcohol of 98° to 99°. The alcohol was added to the united liquors half their bulk of water, distilled and the alcohol off, and poured the residue into a large portion of water, thereby freeing the solutions from resin, which could, after its precipitation, be retained on the filter. From the filtrate the sanguinarin was precipitated by ammonia; this precipitate amounted to 2.4 per cent. of the weight of the root employed. The precipitate, having been dried at 100°, was extracted with ether, the ethereal solution treated with animal charcoal (to remove colouring matters), and sanguinarin in solution precipitated from it as sanguinarin hydrochlorate, by conducting hydrochloric acid gas into it. The hydrochlorate was dissolved in water, the sanguinarin reprecipitated by ammonia, etc. After three precipitations, the sanguinarin was quite pure. When precipitated, it appears white and flocculent; after drying at 100°, rather earthy; dissolved in hot alcohol, it crystallises out on cooling. It melts at 160°, and decomposes at higher temperatures without subliming. The vapours of acids give it a red colour. Its analysis leads to the formula $C_{17}H_{14}N_4$. The hydrochlorate forms double salts with the chloride and cyanide of platinum. The alkaloid also combines with chloride of gold and with iodide of mercury. Most of its solutions show violet fluorescence, possess no absorption lines in the spectrum, and do not rotate the polarized ray. The alkaloid liberates ammonia from

ammonic salts. The author gives a series of reactions of sanguinarin, with various reagents.

Erythrocentaurin in American Centaury. J. F. Huneker. (*Amer. Journ. Pharm.*, xliii., 207.) This principle was discovered in European centaury (*Erythræa centaureum*) a few years ago by Méhu, a French chemist, who obtained it in the minute quantity of one grain from three thousand grains of the herb. The author has proved by the following experiments that this principle also exists in the American centaury (*Sabbatia angularis*).

The flowers and leaves of *Sabbatia angularis*, to the amount of two pounds, were exhausted with one gallon of water, a portion of which was evaporated by a water-bath, and allowed to stand to deposit the apotheme. This was separated by filtration, and strong alcohol added to the filtrate, which precipitated gum. On again filtering, the infusion was evaporated to the consistence of a syrup, and, on cooling, washed with strong ether, which took up erythrocentaurin and deposited it on spontaneous evaporation. Erythrocentaurin, as thus obtained, is a non-nitrogenous principle, in small acicular crystals, which are transparent, but in this case were contaminated with yellow colouring matter, and being in such a small quantity, the experimenter feared losing them in decolourizing.

The crystals have a sharp, acrid taste, reminding one of tobacco, and are soluble in alcohol, ether, water, alkalies in solution, and acids; but insoluble in fixed and volatile oils, being also slightly volatilized by heat.

The only proof that they are similar to erythrocentaurin of the European centaury are:—1st. That they exist in the same minute quantity. 2nd. That they are reddened by solar light; but if dissolved and recrystallised, regain their original colour. Therefore there is not a doubt but that these principles are similar in composition and character.

The author made a series of experiments to determine the proximate composition of American centaury, and found, besides erythrocentaurin, resin, chlorophyll, fatty matter, gum, albumen, pectin, bitter extractive, trace of volatile oil, an organic acid, red colouring matter, and salts. The author regards the aqueous extract as the most concentrated pharmaceutical preparation; he gave ten grains of it to a half-grown cat, which, in a short time, appeared to be under the influence of a narcotic sedative; after sleep, lasting for two hours, violent purgation set in, causing death in 24 hours.

Erythrocentaurin in Erythræa Chilensis, or Canchalaqua. M. C. Méhu. (*Journ. de Pharm.*, x., 454.) The *Erythræa Chilensis*, or

canchalaqua, of Chili, has been the subject of careful study by MM Le Beuf, father and son, of Bayonne. This plant bears a close resemblance, in composition and therapeutical properties, to the lesser centaury of Europe (*Erythræa centaureum*); M. C. Méhu therefore, having obtained some of the plant, sought to ascertain whether it also contained the crystalline principle erythrocentaurin. The herb obtained by the author being two years old, there was some fear that, as in the case of the lesser centaury, the peculiar principle might have disappeared by age.

The coarsely-powdered plant was macerated with boiling water, the infusion evaporated to a syrup, and this was mixed with four times its volume of concentrated alcohol; an abundant deposit formed, which was removed by filtration. The alcoholic solution was evaporated, and the residue agitated in a flask with ether. The decanted ether gave a resinoid mass which contained some crystals. This was treated with boiling water, filtered, and allowed to crystallise. The crystals, still soiled with resinous matter, were dissolved in chloroform, and allowed to crystallise from the solution.

The pure substance so obtained was found to be identical in all respects with the erythrocentaurin extracted from the lesser centaury. It is soluble in 245 times its weight of ether, and fuses at 136° C. Exposed to the solar rays, the crystals redden strongly becoming decolorized when heated to near the point of fusion. When fused, they give a colourless liquid, which sets into a white crystalline mass, which again becomes red on exposure to the sun. The reddened substance dissolves in chloroform, forming a colourless solution which, by evaporation in the dark, yields colourless crystals, again capable of reddening in the solar light.

Vacciniin, a Crystallisable Principle extracted from the Leaves of the Cowberry (*Vaccinium Vitis Idæa*, L.). B. G. Claassen. (*Amer. Journ. Pharm.*, xlii., 297.) Before emigrating to America, the author prepared, in Germany, this crystalline substance from the plant above named. This plant, so common in Europe, grows in but few places of the Northern United States, particularly in the higher mountains of the New England States.

By boiling the fresh plant with water and quick lime, precipitating the decoction with acetate of lead, filtering, treating the liquid with sulphuretted hydrogen, again filtering, evaporating to the consistency of syrup, and allowing the product to stand for several days, it assumes the form of a crystalline jelly, which being placed upon linen so as to let the mother-liquor drain off, and then pressed, yields nearly colourless crystals, which are purified by dissolving them in

boiling water, treating with animal charcoal, and crystallising. The amount of vacciniin in the shrub is about 1 per cent. It forms long acicular crystals, of a somewhat bitter taste, and without any smell. In general, many of the crystals are united, forming fascicles; but sometimes they occur in the shape of four or six-sided (probably rhombical) prisms, with two sides, flattening their ends.

It is scarcely soluble in ether, pretty easily soluble in cold water and alcohol, but very easily in boiling water; so much so, that the latter, having been saturated with vacciniin, after cooling, yields a solid mass. Heated, it melts to a clear liquid; reduced to coal by stronger heat. Neither subacetate of lead nor tannin render any precipitate. Its reaction on litmus paper is neutral. The vacciniin also contains no nitrogen, for, melted with hydrate of potash, it produced no ammonia. The elements will be, therefore, carbon, oxygen, and hydrogen.

A Neutral Crystallisable Principle in Black Snakeroot. (*Cimicifuga Racemosa*.) T. E. Conard. (*Amer. Journ. Pharm.*, xliii., 151.) This substance was obtained by the following method:—

3½ pounds of the root, cut and bruised, were treated with 4½ pints of strong alcohol by maceration for four weeks, and filtered. 2 pints of this tincture were treated with 3 fluid ounces of the solution of subacetate of lead, which completely precipitated the resin, tannin, etc., and most of the colouring matter, as will be seen below. The lead was separated from the filtered liquid by means of sulphuretted hydrogen in excess; after agitating for some time together, filtered. A repetition of the process proved the solution to be entirely free from resinous or gummy substances, also from much colouring matter. The tincture was set aside and allowed to evaporate spontaneously. The resulting powder was treated repeatedly with benzine. The several washings were mixed and evaporated, yielding a minute portion of a disagreeable, nauseous, fatty substance, without colour. The powder was freed from the odour of benzine, placed on a filter, and thoroughly washed with water; then dried and dissolved in 16 times its weight of strong alcohol, forming a saturated solution. This was mixed with 120 grains of pure alumina, moistened with a few drops of water, and agitated for 24 hours; then put in a capsule, and evaporated spontaneously to a very dry light mass. This was put on a filter, and hot alcohol poured on it until entirely exhausted. This was allowed to evaporate, and there remained a crystalline substance of a light yellow colour, not of a very regular or decided shape, but of

a massy appearance, resembling almost exactly the crystals of sulphate of alumina on a small scale. But under the microscope, at low power, their crystalline form was more distinct, presenting an appearance similar to that of rock candy. This substance in powder has little taste, on account of its extreme insolubility in the liquid of the mouth. But its solution in alcohol has the intensely acrid and sharp taste that characterises recent cimicifuga.

The crystals have the following characteristics:—They are very soluble in cold alcohol, more so when heated. Dissolve readily in dilute alcohol, also in chloroform, and slightly in ether; but are entirely insoluble in benzine, turpentine, and bisulphide of carbon. Fusible at a moderate temperature, at a higher taking fire, and at a red heat entirely dissipated.

This substance, from the following experiments and their results appears to be a neutral principle.

A small quantity moistened on a jar lid with liquor potassa, when approached with the stopper of a muriatic acid bottle, did not give off the characteristic white fumes of a volatile alkaloid, nor did it produce fumes when heated with liquor potassa and brought in contact with muriatic acid, as an ordinary alkaloid. A small quantity of liquor potassa put in a tube with a small outlet, was gently heated but no odour of ammonia was given off. Reddened litmus paper remains unchanged by continued contact with its solution. Entirely incompatible with all acids, refusing to unite with them in any proportion. These few facts point very strongly to the conclusion that it is neither an alkaloid nor an acid principle, being entirely indifferent to the alkalies and not reddening litmus paper. The therapeutic properties of this substance have not been ascertained.

Preparation, Reactions, and Uses of Theine. Lewis Thompson. (*Medical Times and Gazette*, 1871, vol. i., p. 185.) The author regards theine as a valuable medicinal agent. It is powerfully tonic and stimulant, and appears to possess the tonic virtues of the disulphate of quinine united to the stimulating powers of wine; but with this difference, that the stimulus from theine is not followed by depression, as in the case of wine and alcohol. Theine seems to act chiefly on the great sympathetic or ganglionic system of nerves, and but slightly on the brain. The author has used it in doses of from 1 to 5 grains, with very marked advantage in the low stage of typhoid fevers, confluent small-pox, and that form of mortification of the toes which is so singularly fatal to old people. It has also been found useful in hemicrania, neuralgia, and what has been called relapsing fever.

The author has discovered that in the ordinary process of roasting coffee, the whole of the theine is driven off before the torrefaction of the coffee is completed. By condensing and collecting the volatile products evolved during the roasting, this theine may be cheaply collected and isolated.

As the result of much experience, he has obtained on an average 13 grains of theine from the roasting of 1 pound of raw coffee; and 13,000 tons of coffee are roasted annually in Great Britain alone, it follows that about 140 tons of theine are wasted every year. The author proposes to employ at one end of the roasting cylinder a tube leading away to the distance of about 3 feet, wherein the theine might be condensed, and afterwards dissolved out and purified in the manner about to be indicated.

Theine is absolutely insoluble in a concentrated solution of the carbonate of potash, and thus we may precipitate it from its admixture with sugar, mucilage, and vegetable extract. If then, by means of subacetate of lead, we have removed from a vegetable infusion tannin, malic acid, etc., we have only to evaporate the filtered solution to a small bulk, and add to it its own weight of dry carbonate of potash, and the whole of the theine becomes at once soluble; so that, having collected this insoluble product, and boiled in rectified spirit, we have a solution of pure theine, which, after filtering off the spirit furnishes crystals fit for immediate use.

The author also mentions a distinctive test for theine sufficiently accurate to detect the one-thousandth of a grain of that substance. Dissolve the theine in a small quantity of water, and pass through it a stream of euchlorine, then allow the fluid to evaporate at steam heat; a blood-coloured substance will remain, which, on the addition of a few drops of cold water, forms a beautiful scarlet solution like red ink. The euchlorine gas is formed by the action of hypochlorous acid upon chlorate of potash.

Santonin, and its Detection in the Urine. Walter G. Smith, B. (*Dubl. Quart. Journ. Science*, Nov., 1870.) Two singular effects are known to result from the administration of santonin in moderate doses, viz., visual derangements and a peculiar alteration in the colour of the urine. It is with the latter phenomenon that the author principally deals; but he gives personal testimony to the effect of santonin on the vision. Three hours after taking 5 grains of pure white santonin he became conscious, while reading, a yellowish tint on the paper, and a yellow haze in the air. His hands, and the complexions of others, appeared of a sallow, unhealthy colour; and the evening sky, which was really of a pale

lavender colour, seemed to be light green. Vision was not perfectly distinct for some hours, and was accompanied by a certain vagueness of definition.

Since the isolation of *santonin* by Kahler, forty years ago, it has almost entirely superseded *santonica*, and within the last twenty years has been largely and increasingly employed as a safe and efficient vermifuge. Various observers have noticed that the urine of persons under the influence of *santonin* is tinged of a saffron-yellow or greenish colour; and Giovanni and Ambroise state that it often induces apparent hematuria. The urine of some of the lower animals, *e.g.*, rabbits, is similarly affected. As in the case of *rhubarb*, the shade of colour depends, no doubt, on the reaction of the urine, which is coloured yellow when acid, and purplish-red when alkaline.

The attention of the author was drawn to the subject by a case in which a boy aged five was given 4 grains of white *santonin* on the evening of August 18th last. Next morning the urine, which had been kept in a tall glass vessel, was of a bright pinkish-red. On the evening of the 19th, the boy took another 4-grain dose. The urine passed soon after was of a greenish-yellow colour. A few drops of liq. *ammonia* immediately produced a clear red tint. The author then made a series of experiments on himself, the result being that he found the presence of *santonin* in the urine might be detected by the alkali test in periods varying from 10 to 50 minutes after it had been taken, and that it was eliminated in from 30 to 50 hours.

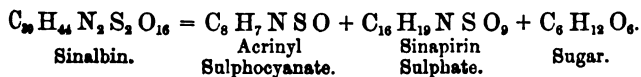
The colour of the urine was in all cases greenish-yellow, sometimes approaching a light saffron tint, the greenish hue being best seen by looking obliquely across the surface of the fluid. It resembled the urine of a person slightly jaundiced, and, like it, stained linen of a persistent light yellow. In two other respects also it curiously conformed to bilious urine. When nitric acid was dropped on a small quantity, a distinct purplish colour was brought out, which, however, was evanescent. Again, when sulphuric acid was added drop by drop, it developed a reddish-brown colour, changing to a deeper brown. No such effects were produced on the urine, when not under the influence of *santonin*. The sulphuric acid reaction was less ambiguous than the nitric acid, which might affect the colouring matter of normal urine somewhat similarly. These reactions, viewed in connection with the altered colour of the urine, show that it would be quite possible, from a hasty examination, to make an erroneous diagnosis of bile in the urine, and point

to a possible fallacy in regard to the two most common clinical tests for bile.

The alkali test for the detection of santonin in the urine is a very striking one, and may be noticed both as to its character and its sensitiveness. It simply consists in the addition of an alkali to the urine, when a fine cherry-red or crimson colour will immediately be developed, according to the amount of santonin present. The urine will respond to potash, soda, or ammonia, and also to lime or baryta water. But potash was found to be the most delicate reagent, and is better suited for general use. The red alkaline fluid is not bleached or altered by boiling, but the colour is at once destroyed by any acid, even carbonic acid gas. The subsequent addition of alkali restores the colour as before. Considering the sparing solubility of santonin, 1 part requiring 5000 parts of water at 17.5 °C., the delicacy of the test will be apparent when it is stated that santonin was detected in the urine within 10 minutes after 4 grains were taken, and within an hour after but 1 grain was taken. In one experiment the urine voided 24 hours after the dose gave a decided red colour with liq. potassæ, even when diluted with 3 parts of water.

For ordinary doses of from 3 to 6 grains, about two days are required for elimination; and it is to be remarked that the urinary colouration and reaction to the alkali test are more persistent than the phenomena connected with vision.

Sinalbin : Constituent of White Mustard Seed. H. Will. (*Zeitschr. f. Chim.* (2) vii., 89, from *Wien. Akad. Ber.*, lxi., 178, and *Journ. Chem. Soc.*, ix., 408, 1871). White mustard seed contains a glucoside, sinalbin, which is soluble in alcohol, and like potassium myronate decomposes in contact with aqueous extract of mustard:—



an albuminous substance being likewise formed. Acrinyl sulphocyanate resembles oil of mustard, is soluble in ether, very pungent, insoluble in water, but not volatile; after warming with an alkali and neutralisation with an acid, it gives a red colour with ferric chloride. Sinapirin sulphate is insoluble in ether.

Sinalbin gives a white precipitate with silver nitrate, from which sulphydric acid removes the silver, leaving acrinyl cyanate, $\text{C}_8\text{H}_7\text{NO}$, fusible at 135°, but apparently different from the known acid of this composition.

The author does not describe the relations borne by these compounds to those constituents of mustard which are already known.

Chemical Examination of Santal Wood. H. Weidel. (*Zeitschr. f. Chim.*, vi., 83). The powdered wood was extracted with water containing a little caustic potash, the dark red liquid thus obtained was filtered and neutralised with hydrochloric acid. The precipitate produced by the neutralisation was repeatedly washed by decantation, then pressed between linen, dried, powdered, and extracted with cold commercial ether in suitable extraction vessels. A fiery ruby-red ethereal solution was thus obtained, of which the ether was distilled off, and the residue, diluted with some alcohol, was left in open basins to evaporate spontaneously. After a day or two's standing crystals had separated which, on washing with cold spirit of wine, appeared colourless. On leaving the mother-liquors standing for longer, more of those crystals are obtained, but Meier's red santaline could not be got from this *first* ethereal extraction. The colourless crystals were purified through repeated recrystallisations from hot alcohol, from which on cooling quadratic, iridescent scales, santal, $C_8H_6O_3 + \frac{1}{2}H_2O$, separate. This substance is insoluble in water, carbon bisulphide, chloroform, and benzol, and only to a very small extent soluble in ether and cold alcohol. The best solvents of santal are dilute solutions of caustic alkalies. An alcoholic solution of santal turns deep red on addition of iron chloride. In concentrated sulphuric acid santal dissolves with lemon-yellow-colour. It yields, on being heated with caustic potash, protocatechuic acid.

On continuing to extract the above-mentioned resin of the santal wood with ether, ultimately a brick-red powder, $C_{14}H_{12}O_4$ (?), is obtained, which appears to be identical with the already quoted santalin of Meier.

Solubility of Cantharidine. C. R. C. Tichborne. (*Pharm. Journ.*, 3rd series, i., 501.) The author gives the following table in connection with a paper on acetum cantharides and liquor epispasticus which we have noticed in the Pharmacy section.

Water.—Insoluble.

Alcohol, Ethylic and Methylic.—Fairly soluble when hot, very insoluble in the cold.

*Acetic Ether.**—Soluble.

*Ether.**—Soluble in 34 parts.

Chloroform.—Very soluble in the cold (as stated by Proctor), ~~seem~~ the best solvent.

Bisulphide of Carbon.—Nearly insoluble.

* These reactions are taken from the published observations of others.

Volatile oils.—Mostly solvents.

Castor and fixed oils.—Very soluble.

Fatty matter of the fly.—Very soluble.

*Sulphuric Acid.**—Soluble. Reprecipitated by water.

Glacial Acetic Acid.—Slowly dissolves in the cold, very soluble in warm acid. A saturated solution in glacial acid is reprecipitated by water.

Acetic Acid, 1.044.—Scarcely soluble. Dissolves by prolonged boiling and crystallises out on cooling.

Weak Soda or Potash solutions.—Nearly insoluble.

Strong Potash or Soda.—Dissolves easily on warming and is not precipitated on diluting, but is precipitated on the addition of acids.

Ammonia.—Weak ammonia has no action upon it, but very strong liquor ammoniæ dissolves it easily after some time, particularly if it is warmed, without a loss of the ammonia.

The foregoing results were obtained with the crystallised active principle; it must be borne in mind, that, operating with the fly, the action may be, and probably is, considerably modified by the other constituents.

On Vanilla Crystals. P. Carles. (*Journ. de Pharm.*, 4th series, xii., 254.) When vanilla is preserved in a place, slightly humid, according to Guibourt, or dry, according to Gobley, it gradually becomes covered with needle-like crystals, the chemical nature of which has not yet been perfectly established. These crystals were first taken to be benzoic or cinnamic acid; and later they were described as coumarin. M. Vee, on account of their fusing point, regarded them as a peculiar acid. M. Gobley, after studying the chemical characters of these crystals represented them as the aromatic principle of vanilla, and proposed for the substance the name of *Vanilline*. Stokkeby, investigating the same subject, called the crystals vanillic acid and determined the fusing point to be 86°, while Gobley found it to be 76° and Vee 78°. The great differences existing in the formulæ and properties assigned to these crystals by different authors render it probable that they did not obtain the same substance, or that it was not in an equal state of purity. The author of the present paper has not experimented with the crystals extracted from vanilla, but has preferred to purify the crystals found deposited in the vessels in which vanilla has been preserved. The purification was effected by two or three successive crystallisations from hot water. By slow cooling, colourless transparent prisms upwards of two centimetres long are ob-

* This reaction is taken from the published observations of others.

tained. Their taste is piquant, but if pure they possess very little odour. They fuse between 80° and 81° C. Heated on platinum in the crystals volatilise without decomposition, and in a tube they sublime very well, like benzoic acid; but they cannot be distilled without partial resinification. The crystals are very soluble in the cold in alcohol, ether, chloroform, sulphide of carbon, and the oils. They are only slightly soluble in cold water; but very easily dissolved at 100° C. On the application of heat they fuse in the water before solution occurs. This crystalline body has a very acid reaction, decomposes the alkaline bicarbonates with slight effervescence, and saturates bases. With strong sulphuric acid containing nitric acid it gives a red colour like brucine. Dilute nitric acid attacks it slowly, but the strong acid exerts a very lively action, and produces oxalic acid. It dissolves in alkaline solutions, and is reprecipitated by alkalis. It colours the persalts of iron blue, reduces nitrate of silver by the aid of heat, and gives an abundant precipitate with the acetates of lead. The elementary analysis of the crystals and of the lead salt leads to the formula $C_{16}H_{16}O_6$ * for the pure substance. The author obtains well defined crystalline salts of this body with lead, magnesia, and zinc. The compounds with the alkalis and alkaline earths become rapidly brown by contact with air, and cannot be obtained in a pure and definite condition.

Examination of the Resin of Tampico Jalap.† Professor H. Spigatis. (*Neues Repert. f. Pharm.*, xix., 452, and *Pharm. Journ.*, 3rd series, i., 344.) The author has published the results of a preliminary examination of the resin contained in this drug with the object of comparing it with the resin of true jalap.‡

Tampico jalap resin was obtained by first extracting the root with water, then digesting it with alcohol, evaporating off the alcohol and washing the resin with water. A second solution in alcohol and treatment with animal charcoal completed the purification. The author gives the resin the name of *tampicin*.

This substance presents a general resemblance to convolvulin. It is translucent, colourless or slightly yellow, brittle, without odour or taste, and readily soluble in alcohol or ether. Its solubility in ether distinguishes it from convolvulin,§ as well as from jalapin, the resin

* The author uses the old equiv., and writes it $C_{16}H_8O_6$.

† Read before the Royal Bavarian Academy of Sciences, 2nd July, 1870.

‡ Kayser, *Ann. Chem. Pharm.*, li., 81, and W. Mayer, *ibid.* lxxxiii. 121, xcv. 129.

§ Sometimes this drug appears to be mixed with the tubercles of other *Convolvulaceæ*, perhaps those of true jalap. One sample of tampico jalap yielded a resin only in part soluble in ether.

Ipomoea orizabensis. It also differs from them in composition. Alcoholic and ethereal solutions have a slight acid reaction.

On the action of strong bases the resin is, like convolvulin, converted with addition of the elements of water, into an acid soluble matter—tampicinic acid.

Strong acids, such as hydrochloric, nitric, or sulphuric acids, when added dissolve the resin gradually, converting it into sugar and an acid—tampicoleic acid. Concentrated sulphuric acid colours resin yellow at first, then dissolves it with a fine red colour, which finally becomes brown. With acetic acid this resin behaves in the same manner as convolvulin, dissolving without being broken

Tampicin is much more readily affected by heat than convolvulin. Melting-point is about 130° C.

Analysis of the resin dried *in vacuo* at 100° C. gave results corresponding with the formula $C_{34}H_{54}O_{14}$; Mayer gives $C_{30}H_{50}O_{18}$ as the formula of convolvulin.

Tampicinic acid resembles convolvulinic acid, being an amorphous, shiny, shining, translucent mass, without odour, and having a sharp, bitter taste. It is hygroscopic, readily soluble in water and alcohol; the solution has an acid reaction, and expels carbonic acid from the alkaline carbonates. It is scarcely soluble in ether.

This acid is precipitated only by acetate of lead and chloride of mercury. Dried at 90° C. *in vacuo* and analysed, it gave results indicating the formula $C_{34}H_{60}O_{17}$; Mayer gives $C_{31}H_{50}O_{16} + 1\frac{1}{2}$

Tampicoleic acid is white and crystalline, with a sharp taste, without odour, readily soluble in alcohol, sparingly in ether, both solutions giving a distinct acid reaction. When heated it melts to a yellowish, liquid that solidifies on cooling to a hard, white, radiated mass. Alcoholic solution expels carbonic acid from the alkaline carbonates.

Analysis indicated the formula $C_{16}H_{32}O_8$. The alkaline salts of this acid are soluble in water, the ether crystallises in rhombic crystals.

Summarising the result of this investigation, it appears that the resin of Tampico jalap resembles convolvulin in belonging to the class of conjugated sugar-compounds or glucosides, while it differs from that substance by its perfect solubility in ether and in composition.

Experiments made in the Königsberg Hospital to ascertain the physiological action of tampicin appear to show that in this respect it resembles the true jalap resin, though it is less certain. Moreover,

the use of this drug in the place of true jalap does not seem advisable, for although its price is only a third of what it was, the much smaller amount of resin it contains, and the large amount of alcohol required for its extraction, renders tampicin dearer than convulvin.

A new Solvent for Indigotin. A. A. de Aguiar and Alex. Bayer. (*Ann. Chem. Pharm.*, clvii., 366, and *Journ. Chem. Soc.*, ii., 268, 1871.)

The authors first call attention to the difficulty of obtaining crystallised indigotin in the pure state, chiefly owing to its insolubility in the ordinary solvents; boiling creasote and phenol, which dissolve it in small quantity, deposit it in a flocculent state on cooling. They find, however, on boiling finely powdered commercial indigo with aniline, that the colouring matter readily dissolves, yielding a deep blue solution, which, if filtered hot, and set aside for some hours, deposits almost the whole of the indigotin in the crystalline state. When required very pure, it should be again crystallised from aniline, and the crystals washed with alcohol and dried.

As thus obtained, it is chemically pure, has a brilliant coppery lustre, and rivals in appearance that prepared by sublimation.

The authors, in their endeavours to find other solvents that might be employed in place of aniline, observed that benzol and chloroform dissolve indigotin in small quantity, and deposit it in a flocculent state on cooling. Alcohol and ether at their boiling temperatures also dissolve it in small quantity.

Solvents for Indigotin. V. Wartha. (*Deut. Chem. Ges. Ber.*, iv., 334, 335, and *Journ. Chem. Soc.*, ix., 568, 1871.)

A. A. de Aguiar and Alex. Bayer,* have described a method by which they obtained indigo in the pure state by solution and crystallisation from aniline. In addition to this, the author has found other solvents by means of which indigotin may be obtained in the crystalline state. Venice turpentine, at a temperature approaching its boiling point, dissolves indigo with the same blue colour as sulphuric acid or aniline; and on cooling, the indigotin separates in the crystalline state, and can be purified by washing with alcohol or ether. Boiling paraffin may also be employed, the solution having the fine red colour of indigo vapour; in fact a dilute solution can scarcely be distinguished from an alcoholic solution of magenta. When cold the indigo crystals may be purified by washing with benzol. The paraffin solution transmits homogeneous red light, and has the same spectrum as the vapour of indigo. Petroleum dissolves indigo with

* *Ann. Chem. Pharm.*, clvii., 366.

a carmine-red colour; spermaceti and stearic acid also dissolve it, the former with a violet, and the latter with a blue colour, it crystallises from Venice turpentine in fine blue tables, and from paraffin in prisms which closely resemble those of sublimed indigotin.

On Curcumin the Colouring Matter of Turmeric Root. By F. W. Daube. (*Deutsch. Chem. Ges. Ber.*, iii., no. 11.)

The author has succeeded in obtaining this colouring matter in a pure, crystalline state. The mode of preparation is the following. The pulverized root is exposed to a current of steam (to free it from its volatile oils), then washed with hot water as long as the washing liquors appear coloured, and dried. The powdered root thus purified is extracted with boiling benzol, and the solution left to cool, when orange-coloured crusts of crude curcumin will separate. One part of curcumin requires 2000 parts of benzol for its solution. The crude curcumin is dried between filter-paper, and dissolved in cold spirit of wine, when a yellow curdled substance remains behind. The filtered spirit solution is treated with lead acetate, which throws down a brick-red precipitate of lead-curcumin; this precipitate is, after washing, suspended in water, treated with sulphuretted hydrogen, and lead-sulphide formed is extracted with boiling alcohol. The solution thus obtained, yields on spontaneous evaporation the curcumin crystals. The solutions of curcumin show the phenomena of fluorescence in yet stronger degree than the ordinary turmeric tincture. Curcumin does not sublime; it begins to melt at 165° C., and is decomposed at higher temperatures. It dissolves to a great extent in alcohol and ether; but its characteristic solvent is, as above mentioned, benzol. It dissolves in alkalies with light reddish-brown colour, and is precipitated from these solutions by acids. Analysis gave figures which assign to it the formula $C_{10}H_{10}O_2$.

On Curcumin. (*Deutsch. Chem. Ges. Ber.*, 1870, No. 11.) M. Iwanof, Gajewsky, has investigated turmeric; and states that sulphide of carbon takes up from that drug an oil containing, besides oxygen, 80.2 per cent. of carbon, and 10 per cent. of hydrogen. This oil boils at from 240° to 260° C. The drug having been next treated with ether, yields to that solvent curcumin, as a yellow-coloured crystalline body, $C_{10}H_{10}O_2$, fusing at 172°; the drug contains, moreover, another pigment and an alkaloid.

Testing Cochineal. J. M. Merrick. (*Amer. Journ. Pharm.*, liiii., 263.)

The author gives the following outlines of the method he is in the habit of using for testing samples of cochineal to ascertain their comparative colouring powers. While it is a much closer and more

accurate method than that which is based upon dyeing strips of mordanted woollen stuffs, it is preferable to the bleaching with chloride of lime method,—as the oxidizing substance used, *viz.*, potassic permanganate, does not precipitate the colouring matter of the cochineal.

I grind to a fine powder, the samples to be tested, weigh out two or two and one-half grammes, and boil this amount in a capacious narrow-necked flask, with 750 c.c. of water, for one hour. The liquid is immediately filtered through dry paper filters, and tested when cold. To test it, 50 c.c. are measured in a flask of that capacity, and poured into another flask of about 200 c.c., and the measuring vessel rinsed with a definite quantity of water, say 10–15 c.c.

A weak solution of permanganate is then run in from a burette with a glass cock, the flask being shaken well after the addition of every 10 c.c.

So much permanganate solution is added that the cochineal extract shall be changed from its original colour to a pink of the very faintest shade, almost yellow, in fact, but never reaching a full yellow. This pink shade should be persistent, that is, it should not turn yellow after standing fifteen minutes; and after a little practice, it will be found very easy to obtain the tinge, which shows that the colouring matter is almost but not quite destroyed.

When a number of samples are to be compared, I arrange an equal number of 200 c.c. flasks and test-tubes on the table, a tube standing in its rack in front of each flask. Then the *same* number of c.c. of the permanganate solution (which should be at least so weak that bulk for bulk of this and the cochineal solution will be required) is run into each flask, taking care to use too little to completely destroy the colouring matter in *all*. The flasks are well shaken and allowed to stand for ten minutes.

Part of the contents of each is then poured into the corresponding test-tube, and a glance at the tubes as they stand side by side, will show which is the least affected by the bleaching liquid. This sample having been selected to serve as a standard, the contents of the test-tube are returned to this flask, and more permanganate solution cautiously added, until a very faint pink tinge, which a fraction of a c.c. will turn to a full yellow, is obtained.

The number of c.c. used having been noted, a fresh trial is made, in which the c.c. required, minus one, are used, the flask agitated, and the last c.c. or part of it, as the whole may not be necessary, added. If the two results agree, the next sample is treated in the same way, and so on until all are tested.

I usually make a final trial by measuring the 50 c.c. of each solution into its flask, running the permanganate in the ascertained amount into each as quickly as possible, letting the flasks stand ten minutes, and then making a comparison of all in the test-tubes.

If the shades are not exactly alike, a pretty good guess can generally be made of the fractions of c.c. required, which should be added, the contents of the tubes being joined to that in the flasks, and a second or a third comparison thus made.

This is a rather long description of what in practice is a very simple and good process, the three principal points to be borne in mind being,—

1. To use a weak solution of permanganate.
2. To have a very faint pink colour as a standard of comparison.
3. To let the liquids remain after agitation together 10–15 minutes before comparing them.

I may add, that it is very remarkable how little can be told of the value of a sample of cochineal by a mere physical examination, and that the frequent inconsistency between value and price is equally surprising. I have known samples to differ *thirty* per cent. in colouring power, and only one or two cents per pound in price.

The Poisonous Principle of the *Coriaria Ruscifolia*. W. Skey. (*Chem. News*. xxii. 314). The *Coriaria ruscifolia* or tutu plant, occurring in New Zealand, is a very formidable poison, and the author has made some experiments with a view of isolating, if possible, the poisonous principle. He failed to detect any trace of an alkaloid, but he found existing more or less throughout the plant a peculiar oil, which he extracted from the seed by alcohol and ether. Five minims of this oil administered to a full grown cat caused severe symptoms of poisoning; and the author has no hesitation in ascribing the injurious properties of the plant to this substance.

The oil is somewhat viscid at common temperatures, but flowing freely at a little above this; colour, pale green; reaction, acid; taste, bland; burns away readily with much flame; scarcely volatile without decomposition; soluble in ether, alcohol, chloroform, and strong acetic acid; insoluble in hydrochloric or nitric acid, also insoluble in water; does not dry when long exposed to the air. It is soluble in a cold alcoholic solution of potash, without yielding a precipitate when admixed with water.

From the reaction of this oil, it evidently belongs to the series of non-drying fixed oils; in its solubility in alcohol or acetic acid, it bears a remarkable resemblance to castor oil, the only other fixed oil which he finds to be wholly soluble in acetic acid.

be applied:—Put about a quarter of an ounce of the suspected sample into an ounce vial, and add pure linseed oil till it is about three-quarters full. If the sample under examination contain resin oil, the pure linseed last added floats on the top, the line of contact being plainly visible. If the finger be now placed on the mouth of the bottle, and the latter inverted two or three times, and held up to the light, bright wavy streaks will be observed, caused by the slow mixing of the two oils. Even 5 per cent. of resin oil may easily be detected in this way. Place a slab of clean glass on a piece of white paper; at one end put from ten to twenty drops of a known sample of pure linseed oil, at the other an equal quantity of that suspected; to each add one drop of oil of vitriol. On the pure linseed oil a dark-brown spot slowly forms; if the suspected sample contain resin oil, a dark reddish-brown spot quickly forms, retaining its red colour for a long time, and a peculiar scum forms over it. Resin oil may be detected in boiled linseed oil in a similar manner, and with the same certainty, the reactions being more rapid. A sample of genuine boiled oil must be used for the comparison. The resin oil used in adulterating linseed oil is half the price of the latter; it is free from smell even when heated; it has a peculiar metallic taste, which is not masked by the linseed oil. It greatly retards the drying properties of linseed oil, causes it to remain "tacky" for some time, and prevents it ever becoming "hard."

To Detect the Purified Mineral Oil used in the Adulteration of Refined Rape (Colza) Oil.—The mineral oil is rather lighter than rape oil, having a specific gravity of 0.902 (the gravity of refined rape being about 0.914). When mixed with rape it may be detected by a slight but peculiar smell on gently heating, and by a slightly disagreeable taste. It imparts the opalescent appearance peculiar to all earth and mineral oils. Bright wavy streaks may also be seen when an adulterated sample is mixed with a pure sample, as described above, but in this instance the pure oil should be added first. Place a slab of clean glass on a piece of white paper, and on one end put from ten to twenty drops of a known sample of refined rape, at the other an equal quantity of that suspected, to each add one drop of oil of vitriol. On the pure rape a pale yellow spot slowly forms, throwing out dirty orange streaks; on the adulterated sample a reddish-brown spot quickly forms. Mineral oil interferes greatly with the burning of refined rape, causing smoke and great deposit on the wick.

Assay of Soaps. M. F. Schulze. (*Journ. de Pharm. d'Anvers*,

1871, 180.) The author's process is the reverse of Clark's soap test for the hardness of waters. He dissolves five grammes of soap in boiling water, and dilutes the solution to a given volume; 100 c.c. for soft soaps, 200 c.c. for hard soaps. This solution is introduced into a graduated burette, and added drop by drop to 20 c.c. of pure water, mixed with 3 c.c. of a calcic solution containing 1·6 grammes of lime per litre, until by agitation a froth is obtained which will stand for five minutes. The quality of the soap is in inverse proportion to the quantity required to produce this effect, and is best expressed by comparison to some typical soap.

Preparation of Pure White Gutta Percha. (*Journ. App. Chem.*, July, 1870.) This substance is now much used in dentistry, and for other purposes, and as different qualities, some of them very inferior, are in the market, some of our professional readers may thank us for the details of a simple process for manufacturing it. Four ounces of the purest gutta percha that can be selected are to be digested for several days with five pounds of methyl-chloroform until a solution is obtained thin enough to pass through filtering paper, care being taken during the operation to prevent any loss of the chloroform by using the apparatus constructed for that purpose. The solution is then to be filtered (an additional pound of chloroform will facilitate this), and should then be clear and nearly colourless. Alcohol is now to be added in sufficient quantity to precipitate the gutta percha in a voluminous white mass, which then is to be washed with alcohol, pressed in a cloth, and dried in the air. It must finally be boiled in water in a porcelain vessel for half an hour, and while still hot rolled into sticks. The chloroform can be separated from the alcohol by adding water, and the alcohol recovered by distillation.

Hæmatosine, a new Medicine. (*Pharm. Centralhalle*, 1871, p. 187.) Prof. Fabourin of Lyons proposes hæmatosine, the colouring matter of blood, for a new medicine, since it contains about 10 per cent. of iron. It is prepared in the following manner:—The blood is solidified with some indifferent salt into a cake, the latter broken into pieces and extracted with alcohol, to which two or three per cent. of an acid has been added. The alcoholic solution deposits on neutralisation the hæmatosine in impure state; collecting the precipitate on a filter, washing it with water, then with alcohol, finally with ether, pure hæmatosine is obtained. Dried, it is a brown powder of metallic lustre, without odour and taste, insoluble in water, alcohol, and ether, but soluble in the latter two in the presence of a little acid or alkali. It may be taken

in the form of powder, pills, syrup, etc., or simply mixed into chocolate, soup, etc. It is easily assimilated, not producing any disorders in the digestion, thus possessing some advantage over other iron preparations.

Note on the Constitution of Albumen. J. Alfred Wanklyn. (*Pharm. Journ.*, 3rd series, i., 263). M. Béchamp has recently repeated his statement that urea is obtainable from albumen by means of permanganate of potash, and has published details which seem to leave little doubt on the subject. The fact that urea is itself oxidisable by permanganate of potash will go a long way towards explaining the failures experienced by other chemists in their attempts to get it from albumen.

Some results obtained by Chapman, Smith, and myself, in the course of investigations undertaken for the purpose of establishing the ammonia method of water-analysis, would seem to indicate that urea exists ready formed in albumen; or rather that albumen is, like creatine, a compound wherein urea and something else are joined together, with loss of the elements of water.

When albumen is mixed with aqueous solution of caustic potash, and then dried-up in the oil-bath, it yields one-third of its nitrogen in the form of ammonia, the remaining two-thirds being obtainable as ammonia on boiling the dried-up mass with a solution of permanganate of potash. But, if the preliminary evaporation to dryness with caustic potash be omitted, the action of strongly alkaline permanganate of potash converts only two-thirds of the total nitrogen of albumen into ammonia.

Now, a caustic alkali converts urea into carbonic acid and ammonia; but permanganate of potash oxidises it, so as to yield no ammonia, the nitrogen in this case making its appearance either in the state of gas or as nitric acid.

So likewise in the case of creatine, one-third of its nitrogen is evolved as ammonia when permanganate of potash is employed, and in creatine one-third of the nitrogen is present in a form other than urea, while two-thirds of it exists as urea.

It would, therefore, appear that one-third of the nitrogen in albumen exists in the state of urea, while the remainder is in some other state of combination.

A Confirmatory Test for Albumen in the Urine. M. Ludovic Bouland. (*Journ. de Pharm.*, 4th series, xii., 293.) When urine gives, by heat and by nitric acid, a precipitate insoluble in this acid, there is evidence that it contains albumen. The author recommends the following confirmatory test to be applied in such cases. The preci-

pitate is collected, well washed, and dissolved in a little potash. To this solution is added one or two drops of Barreswill's solution (*cupro-potassic tartrate*); a fine, rich violet colour is obtained, especially if the albuminous solution is somewhat concentrated. In this case it is not even necessary to apply heat to obtain the reaction, which, however, is required if the liquid only contains little albumen. The author states that this reaction is very characteristic.

Preparation of Uric Acid. By Mr. Wolcott Gibbs. Guano, which is the most abundant source of uric acid, cannot well be employed for the preparation of this acid, on account of the extreme difficulty there is of procuring a pure and colourless product. The author obtained, with the impure and highly-coloured uric acid of guano, a pure uric acid by dissolving it in caustic potash, adding 5 per cent. of bichromate of potash, boiling for some moments and filtering, after having added water, and shaken it with animal charcoal. It suffices to add chlorhydric acid to the alkaline solution to obtain uric acid very slightly coloured, and which a prolonged ebullition with chlorhydric acid renders entirely colourless.

An Improved Method of Obtaining Glycocholic Acid. E. V. Gorup Bezanetz. (*Ann. Chem. Pharm.*, clvii., 286, 287, and *Journ. Chem. Soc.*, ix., 382, 1871.) The author finds that the following method of obtaining glycocholic acid is easier and more certain, and yields a larger amount of acid than those of Strecker or Hoppe-Seyler.

Ox-gall is taken from the bladder, evaporated nearly to dryness in a water-bath, and the residue is exhausted with alcohol of 90 per cent. The alcohol is evaporated or distilled off; the residue, diluted if necessary with water, is treated with milk of lime, and gently warmed; whereupon the greater part of the colouring matter is carried down with the lime, and the liquid is filtered, and allowed to cool.

The filtrate, generally of a slight wine-yellow colour, is then treated with dilute sulphuric acid (avoiding excess) till a permanent turbidity is produced, and allowed to stand. In a few hours the whole fluid becomes a mass of crystals of glycocholic acid.

This is thrown on a filter (it is best filtered by using a water air-pump), washed with cold water, and pressed, first between blotting-paper, and then in a wooden screw-press. The acid is then generally colourless. It may be further purified by again dissolving it in a large amount of lime-water, and adding dilute sulphuric acid till a permanent turbidity is produced, when perfectly pure glycocholic acid separates in fine needles of dazzling whiteness.

Hoppe-Seyler allows the alcoholic solution of the acid to evaporate at ordinary temperatures, and the acid to recrystallise from this in ether to purify it.

Gorup-Bezanetz, like Strecker, could never obtain crystals in this way, but always got a resinous mass. By his own method it sometimes happens that, several hours after, a permanent turbidity has been produced in the filtrate from the lime precipitate by dilute liphuric acid, a thickish oily mass is found at the bottom of the vessel, while the liquid above becomes gradually clear. After a few days or weeks, this mass becomes converted into crystals of glycolic acid. What conditions occasion this anomaly he was unable to discover.

Glycerine Extracts of Pepsine and other Ferments. Mr. M. Foster reports, in *Nature* (iii., 168.), the result of a repetition of some experiments, published a short time ago by Von Wittich, in *Pflüger's Archiv*, upon the isolation of pepsine, and other so-called ferments, by means of concentrated glycerine.

After washing the mucous membrane of a pig's stomach, it was freed as much as possible from water, minced, bruised, and covered with pure glycerine. Having stood twenty-four hours, a few drops of the glycerine, diluted with acidulated water, digested fibrin readily. This process was repeated four times, each resulting extract manifesting strong peptic powers. Treated, after filtration, with an excess of alcohol, these extracts gave a slight precipitate, which, separated by filtration and redissolved in acidulated water, was strongly peptic.

Salivary gland and pancreas yielded to glycerine a starch-converting ferment, and a "laden" pancreas gave a ferment digesting rice in an alkaline medium. Ungerminated barley gave up a α -proteid diastase; almonds, a ferment acting on amygdalin.

The author thinks that glycerine offers advantages in the investigation of this subject not presented by any other medium, as the extracts remain unchanged for a long time, while the tissues, being little altered after exhaustion of their ferment by repeated treatment with glycerine, may be examined under conditions hitherto impossible. He claims that these results are also of practical value in the separation of the so-called pepsin for medical purposes; as by glycerine a pure palatable peptic liquid, apparently keeping any length of time, and certain in its action, can easily be obtained.

Glycerine Solutions of Pepsin and other Substances. L. S. Beale. (*Nature*, iii. 207.) Dr. Lionel S. Beale writes as follows regarding the foregoing:—

In *Nature* of December 29th, Professor M. Foster calls attention to the method of making glycerine extract of pepsin pursued by Von Wittich, and remarks, with reason, that the means hitherto adopted for preparing pepsin for medical purposes are clumsy and inefficient. There is, however, one exception, a mode of preparation which has long been in use, and which is by no means inefficient. This will be found to possess some practical advantages over the process of extracting the fresh mucous membrane with glycerine, while from it the glycerine solution can be prepared quite as pure and clear, and as strong as by maceration.

As long ago as 1858 (*Archives of Medicine*, vol. i., pp. 269-316) I described a method of obtaining the active digestive material from the pig's stomach, which answers perfectly, and has been employed in practice ever since. It simply consists in quickly drying the mucus expressed from the stomach glands upon glass plates. The dried mucus is then powdered, and kept in stoppered bottles. It retains its properties for years. Eight-tenths of a grain will dissolve one hundred grains of coagulated white of egg.

Now, from this powder is easily prepared, by solution in distilled water, a perfectly clear and colourless digestive fluid of great activity, which can be readily filtered.

Some years ago I found great advantage from subjecting tissues to the action of a very small quantity of this solution in glycerine, and keeping the whole at the temperature of 100° for some hours. By this process the elements of the tissue were softened, and could be dissected from one another readily for examination under the highest magnifying powers.

No doubt there is much to be learnt concerning the nature of the action of such substances upon tissues by the use of glycerine solutions. For microscopical work glycerine is of more use than any other medium. Not only may various substances be removed from tissues, but others may be introduced, and the tissue subjected to the action of various reagents without destroying it. In fact, the action may be regulated with the greatest nicety. Nearly all the tests required in microscopical examination may be dissolved in glycerine ("How to Work with the Microscope," p. 297, 1867), and tissues of the most delicate character may be preserved in it, and will retain their microscopic character for years, if care be taken to obtain the best and strongest glycerine.

Liquid Pepsin and Saccharated Pepsin. G. Scheffer. (*Amer. Journ. Pharm.*, xliii., 3.) In the *Amer. Journ. of Pharmacy* for March, 1870 (xlii. 98), the author published a paper, in which he gave the following process for preparing a liquid pepsin :—

Six pounds of the mucous membrane of hog's stomach are macerated in a mixture of—

4 pounds of glycerine,
4 pints of water,
6 ounces of pure hydrochloric acid,

for thirty-six hours; after which the mass is put on a strainer, and when the liquid has drained, the membrane is macerated again with three pints of water for two or three hours, then strained, and this proceeding repeated with smaller quantities of water until ten pints of liquid are obtained.

The resulting liquid will be found mucilaginous, very turbid, and of a strong disagreeable odour. After standing a few days, however, the liquid becomes limpid, a precipitate of mucus forms, and, by filtration, a clear, light straw-coloured liquid is obtained, possessing a faint and disagreeable odour. Liquid pepsin, properly prepared according to the above formula, is of such a strength, that one fluid ounce is capable of dissolving one and a half drachms of coagulated albumen.

In a subsequent communication to the same journal (xliii., 3.) the author states that he had found the foregoing solution apt to become mouldy during the summer weather. He therefore thinks it expedient to increase the quantity of glycerine, so that it shall form 50 per cent. of the preparation, without changing the proportion of mucous membrane or hydrochloric acid.

In the latter paper the author also gives a process for preparing *dry pepsin*, which, while available for dispensing in the form of powder, would serve for the preparation of a solution.

After having precipitated the pepsin, and freed it of water as much as possible by means of a press, it is mixed in the damp state with a weighed portion of sugar of milk, and rubbed in a mortar until it has become dry. By weighing the mixture again, the quantity of exsiccated pepsin is ascertained, and sufficient milk sugar is added to reduce it to such a strength that one grain of the saccharated pepsin shall dissolve 12 grains of coagulated albumen. One grain is then equal to one teaspoonful of the author's liquid pepsin, which is the dose usually given. To prepare liquid pepsin from the dry, saccharated pepsin, the author uses the following formula:—

Sacch. pepsin	64 grains.
Water	5 fl. oz.
Hydrochloric acid	1 fl. drachm.

Shake in a bottle until the milk sugar, and pepsin are completely dissolved; then add glycerine 3 fl. oz., and filter. A colourless liquid is formed, of which 1 fl. dr. dissolves $1\frac{1}{2}$ drachms of coagulated albumen.

In both these papers the author quotes a number of experiments on the comparative power of the different pepsins of commerce; and he also shows that wine of pepsin never does, and, in fact, cannot, possess any digestive power, owing to the quantity of alcohol present in the wine employed.

A Combined Solution of Pepsin and Pancreatin. R. J. Kinkead. (*Lancet*, 1870, ii., 667.) In the "Year Book of Pharmacy," vol. i. (1870), an abstract of a paper by Mr. E. Long, was given in which the author described a glycerine solution of pepsin. Dr. Kinkead now refers in satisfactory terms to the trials he has made of this preparation. He also states that at his suggestion, Mr. Long has prepared a combined solution of pepsin and of pancreatin obtained directly from the fresh pancreas of the calf.

The result has been very successful; for while meat, beef and mutton, digested in pepsin alone, was found to be entirely dissolved with the exception of the fat, which floated as a film on the surface, this film was entirely emulsified when a proper quantity of pancreatin was added, and the usual conditions as to temperature, etc., attended to. An ounce of meat (fat and lean about equal parts) with an ounce and a half of water, 15 minims of hydrochloric acid, and a drachm of the combined solution, after digestion at 100° for four hours, was converted into a homogeneous pulp, and when diluted with a little water presented quite a *chylous* appearance.

Lime Juice and Pepsin. A. Farr. (*Med. Times and Gazette*, 1871. i., 302.) Besides pepsin and pancreatin, now much used as aids to digestion, there are certain food solvents equally worthy of attention, which have hitherto been somewhat neglected. The gastric juice, besides certain saline matters, contains a free acid and the organic substance called pepsin, both of which are secreted by a healthy stomach during a meal, and are essentially necessary for its digestion. While pepsin always constitutes the fermenting principle, the acid of the gastric fluid varies,—hydrochloric, phosphoric, lactic, and acetic acids having been found therein. The gastric juice is in itself antiseptic, and this antiseptic virtue appears to depend greatly upon the acid portion. A few grains of pepsin moistened with water and submitted to a temperature of 100°, will in a short time ferment and emit a strong, almost urinous, odour. But if a few drops of hydrochloric, phosphoric, or acetic acid

reviously added, no such smell will be perceived. The solvent effect of certain acids upon albuminoids may be shown by coarsely mincing a small portion of meat, and adding sufficient water to cover, acidulated with either of the above-mentioned acids,—hydrochloric acid especially. If the mixture be then digested at the heat of the stomach for three or four hours, it will be found that although reduced to such a homogeneous mass as it would have been by *spina porci*, nevertheless the solvent action of the acid is manifest.

In order to test the comparative digestive powers of hydrochloric acid and pepsin, Eberle suspended a solid piece of meat in solution of each. He found that, in a few hours, the piece of meat in the pepsin solution had wholly disappeared, but the piece in the acid solution remained. Although this experiment proves that pepsin constitutes the digestive principle of the gastric juice, it does not prove that the acid is not a food solvent. Pepsin dissolves by virtue of its fermentive action. There is evidently an attracting affinity between the ferment and the albuminoid resembling chemical affinity, inasmuch as a new compound is the result. The acid, possessing no such affinity, acting on such a complex texture as a piece of meat, and that in a state of rest, could not be expected more than partially to exert its solvent action under circumstances so unfavourable to its action. But if the changes that food undergoes previous to and on entering the stomach, by mastication and by the powerful muscular action of the stomach, be taken into consideration, it will be readily perceived that it is here that the acid of the gastric juice, if it act at all as a food solvent, would be found to exercise its power. This may explain the *modus operandi* of lime-juice and other acids in curing or preventing scurvy. All the acids that have been discovered in the gastric juice are, without exception, antiscorbutics.

Dr. Farr considers that indigestion also may arise almost or quite as frequently from a want of acid as from a deficiency of pepsine in the gastric juice. He has noticed many times that where pepsine alone has failed to relieve dyspepsia, the exhibition of one of the non-astringent acids has been successful. Believing that the prophylactic virtue of lime-juice and other acids depended upon their direct action as food solvents, it occurred to him that an excellent artificial gastric juice might be made by allowing lime-juice to represent the acid portion. Accordingly he had a mixture of lime-juice and pepsine prepared, which he reports that he and many of his medical friends have used successfully in cases of dyspepsia. He says that lime-juice with either pepsine or pancreatine makes a

very elegant preparation, is very convenient for prescribing, and may be made to keep almost any length of time without deterioration.

Comparative Value of the Pepsins of Commerce. R. V. Tuseo. (*Lancet*, 1870. ii., 212.) In this article the author gives the details of some carefully conducted and valuable experiments on the relative digestive power of the different pepsins of commerce. The results indicate that some of the pepsin sold is almost worthless, and that, as regards other samples, a wide difference exists in their digestive energy.

Pepsin. G. A. Zwick. (*Amer. Journ. of Pharm.*, xliii., 261.) In this paper the author communicates the result of some experiments undertaken with a view of finding a good formula for the preparation of pepsin, suitable for adoption in the next edition of the U. S. Pharmacopœia.

1st. A fresh stomach of a pig was emptied, and the slimy mucous substance scraped off, spread upon a glass plate, and dried.

2nd. The mucous membrane (scraped off as above) was dissected from the body of the stomach, cut up into moderately fine pieces. This weighed 8 oz.; it was digested with ʒviij pure glycerine (acidulated with ʒij muriatic acid) for twelve hours, expressed, and more glycerine added, till ʒviij were again obtained. This fluid was set aside and separated after a few days; the clear was poured off and filtered, warming it a little to facilitate filtration.

3rd. Another pig's stomach was cleanly washed and wiped, macerated with water (acidulated with hydrochloric acid) for twelve hours, this water poured off, and more added, washing and rubbing the membrane well. All these washings and the first infusion of twelve hours, making 24 ounces, were filtered, precipitated with acetate of lead, and treated with sulphuretted hydrogen, being the process mentioned in the U. S. Dispensatory, but the liquid pepsin was evaporated to ʒviij only, not to dryness.

To compare these preparations they were tried with coagulated albumen.

No. 1. Six-tenths ($\frac{6}{10}$) of a grain of the dry mucus dissolved 12 grains albumen.

No. 2. One fluid drachm of glycerine preparation dissolved 12 grains of albumen.

No. 3. Five fluid drachms (ʒv.) of the watery solution dissolved 12 grains of albumen.

The above result, however, does not represent the utmost solving power, excepting of No. 1. Nos. 2 and 3 suffered losses of pepsin.

No. 2 lost pepsin on account of being digested and warmed while in contact with the mucous membrane, evidenced by the fact that the mass became quite soft and pulpy. The process should be carried on cold. No. 3 lost some of the precipitate during washing. This process is not practicable in warm weather, as the liquors decompose rapidly.

The author, summing up his experience, takes No. 2 as the process furnishing the most permanent preparation, being agreeable both to the eye and the palate of the patient. It has a bright, clear straw-colour, an agreeable bland taste, and could be made double the above strength. It is not subject to the changes and other objections of the powders, is ready when it passes out of the hands of the apothecary, without further mixing, and not objectionable in taste to the most fastidious.

Experiments on Digestion. (*Lancet*, 1870. ii., 480). The chemical and physiological conditions present in the alimentary canal are so complex in their nature, that every pains-taking inquirer, notwithstanding the frequency with which the ground has been turned, seems to make fresh discoveries, or at least to open up new paths of research. The most recent investigations that have been made are those of Dr. Paschutin, who has had the resources of the excellent laboratory of Professor Setschenow, of St. Petersburg, at his disposal. His researches have chiefly been directed to the determination of the digestive powers of infusions of the mucous membrane of the small intestine for albuminous compounds, and on the nature of the ferment converting starch and cane-sugar into grape-sugar. He states that aqueous infusions of the mucous membrane of the small intestine of the dog, when maintained at a temperature about 100° F., undergo self-digestion, and in the course of three or four hours throw down voluminous precipitates of albumen, that undergo no further change till putrefaction sets in, the liquid at the same time altering its reaction from alkaline to acid, and the material, whatever it may be, that is able to reduce oxide of copper, and which is always present in the fresh infusion, disappearing. The infusion of the mucous membrane appears to have no power of converting albuminous compounds into peptones, and only a slight power of emulsifying fats. He also found that the secretion of the small intestine obtained by Thiry's method was equally inoperative regarding albumen and fats. The infusion of the mucous membrane of the small intestine, however, can convert starch into sugar. It is curious to notice that this power is possessed also by the mucous membrane of the trachea, urinary bladder, and, though to a less

marked extent, by that of the gall-bladder, cæcum, large intestine, stomach, and rectum. None of these, however, can, like the infusion of the mucous membrane of the small intestine, convert cane-sugar into grape-sugar. This last power he has found to be possessed by the dog, pig, rat, mouse, and rabbit, but not by the membranes of the sheep and cow.

Further investigations enabled him to demonstrate that the infusions of those membranes that can convert starch into sugar and cane-sugar into grape, contain *two* distinct ferments, the mode of separation of which would be too long to insert here. The infusion of the muscular layers of the small intestine furnishes the chief part of the ferment capable of converting starch into sugar. A temperature exceeding 140° F. seriously interferes with the action of the ferments. With regard to the saliva, he found that the temperature at which its peculiar ferment, when diluted with ten or twelve parts of water, acts upon cooked starch most intensely is from 100° to 106° F. It is more difficult to determine the temperature at which saliva exercises its greatest activity on the uncooked starch, but it is certainly higher than the latter degree. When the ferment is weak it is probably about 144° F.; when concentrated, about 149° F. Dr. Paschutin shows that the admission of air at ordinary temperature to starch paste speedily causes the formation of a material that is capable of acting as a ferment, and is capable of reducing oxide of copper. Such modified starch-paste can act as a ferment to free paste, but the power is destroyed by boiling.

Parchment Paper as a Filtering Medium. Charles R. Tichborne, F.C.S. (*Pharm. Journ.*, 3rd series, i., 881). The Bunsen filter is now well known and familiar to most manipulators. It merely consists of a funnel and filter connected with an air-tight vessel, in the interior of which a partial vacuum can be produced, either by a Sprengel or ordinary air-pump; in fact, by any contrivance by which a downward pressure of some considerable power is exerted upon the fluid washing some precipitate, or upon a liquid it is desirable to filter quickly.

To give us the opportunity of doing this properly, it is necessary to have a nicely prepared support beneath the nozzle of the filter, to enable it to bear the considerable pressure to which it is exposed; the nozzle of the filter being the point of weakness. This is generally done by very carefully forming a little cone of platinum foil, which must exactly fit the bend of the funnel. If the fit is not perfect, it generally results in the breaking of the filter and the failure of the experiment. This is at once obviated, and the platinum nozzle dis-

pensed with, by using parchment paper as a filter. Parchment paper bears, under such circumstances, any reasonable pressure; and yet it is a perfect filtering medium. As regards the strength, Dr. Hoffman says that it becomes five times as strong as the paper before it is parchmented; and the author thinks that, when speaking of moist bibulous paper, it is no exaggeration to say its strength is increased at least twenty times.

In making the parchment paper for this purpose, the following method should be adopted. It differs very little from the ordinary one, except as regards a few precautions:—one part of pure sulphuric acid and one half-part of distilled water are well mixed in a dish or shallow vessel. Where practical, this mixture should be ice cold, and under no circumstances must it be used while it is warm. Pieces of Swedish filtering-paper should then be dexterously floated upon the acid, so as to bring every particle of the surface in contact with it. But it is not necessary to parchmentise both sides. The next point of importance after the cooling of the acid mixture is the quickness used in the washing, which must be thorough.

This paper, which has proved itself so useful to us for dialytic purposes, forms the most perfect filtering medium, if properly managed, with which the author is acquainted. Although, under ordinary circumstances, it is nearly impervious to fluids, they pass through with perfect facility under pressure. The structural change produced by sulphuric acid upon cellulose is the converse of most of the other acids. Thus in paper converted into pyroxylin by the action of nitric acid the fibres are seen, when examined with the microscope, to be more or less contracted, and the result is a non-contiguous, or friable structure, covered with small holes; but in parchmented paper the fibres are swelled considerably in bulk, and are converted into a colloid or gelatinous substance, which, although slowly pervious to fluids, is very homogeneous in texture, and hence its strength.

In Bunsen's original paper he speaks of the difficulty of preventing filaments of the paper used from becoming mixed with precipitates. "Thus," he says, "another and an inestimable advantage springs from the peculiar condition of a precipitate filtered by this method,—the surface of the filter becomes injured and torn, so that the precipitates become mixed with filaments of paper. Gelatinous precipitates (when washed under pressure) adhere to the filter in a thin coherent layer, and may be removed piece after piece so completely that the paper remains perfectly clean and white." Now parchment paper is of that nature that it might be scraped with a knife or brushed, without invalidating a quantitative analysis.

Parchment paper would be perfection for filtering by pressure; but, alas! it has one drawback. The practical difficulty is in making the filter lie close to the funnel, so as not to permit atmospheric air to pass down by the side, instead of exerting its pressure upon the surface of the liquid in the filter. This difficulty is removed by placing an inner filter of ordinary filtering-paper larger than the parchment paper one; therefore the latter should be thin, and only treated with acid on one side. It is from this reason that parchment paper may be used more advantageously in a Bunsen filtering-apparatus made on the principle of a percolator—the bottoms of the upper vessel being covered with good strong paper, strengthened with muslin; such an apparatus as this is applicable to many purposes, such as quick and thorough exhaustion of a powder by any menstrum, or the separation of crystals from a viscid liquid.

Filtration of Strong Acids. J. St. Clair Gray. (*Chem. News*, xxii., 165). The author recommends the following method of making a filter suitable for strong acids:—

Into the narrow part of an ordinary glass funnel, spun glass (such as is used in making tails for glass birds) is closely packed, and over this is sprinkled ground glass to the depth of a quarter of an inch, care being taken that both the funnel and glass are perfectly clean. About four ounces of boiling water are then allowed to pass through the filter, which is then allowed to dry, and, previous to being used is moistened with a pure specimen of the acid to be used.

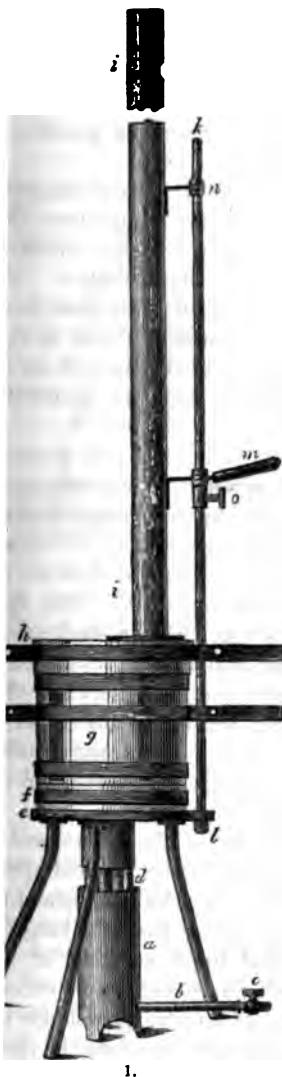
Gas Furnace for Chemical Operations at a White Heat, without the aid of a Blowing Machine. Charles Griffin. (*Journ. Chem. Soc.*, 2nd series, viii., 280.) Fusions at a white heat can be readily effected by a gas-furnace supplied with air by a blowing machine. But a furnace of that description has several defects: the blowing machine is expensive; it is cumbersome in a laboratory; it demands constant labour during a fusion; and it produces so much noise as to interrupt every kind of quiet work.

The furnace now described is free from these defects. It is small and portable, easily put together and taken asunder. It demands no blowing machine, and only a small chimney. It acts without smoke or dust or noise. Its heating power is sufficient to raise a $4\frac{1}{2}$ inch clay crucible, filled with metal, to a white heat. Cast iron can be fused in it, and cast into ingots of the following weights.

Commencing with the furnace cold:

- An ingot of 2 lbs. in 70 minutes.
- An ingot of 3 lbs. in 90 minutes.
- An ingot of 4 lbs. in 24 hours.

gold, and copper, can be fused in larger quantities and in less time. The furnace is represented by Fig. 1. Its height, including the muffle, is about 2 feet. The external diameter is 8 inches.



1.



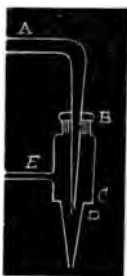
2.

Gas Muffle Furnace.—When the furnace cylinder *g*, Fig. 1., is replaced by an oval furnace body which contains a muffle, as represented by *M* in Fig. 2, all other parts of the furnace, remaining as represented by Fig. 1., the usual muffle operations can be performed, such as cupellation, the roasting of ores, the combustion of organic bodies for their ashes, the burning of filters, etc. The muffle belonging to this furnace measures 7 inches in length, $3\frac{1}{2}$ inches in width, and $2\frac{1}{4}$ inches in height. It acquires a bright red heat, sufficient to melt silver, gold, and copper. This heat can be kept steady and uniform for hours, and being free from dust or soot, is particularly suitable for such operations as annealing. (By

slight improvements which the author has recently effected,

he is now enabled to melt cast iron in crucibles placed within muffle.)

On a Steam Filter Pump. Dr. J. Walz. (*Chem. N. xxii.*, p. 163.) There are many places in which the Bunsen filter pump cannot be employed on account of a deficiency in the water supply. For such cases a plan has been devised by Dr. Walz of New York, editor of the *Manufacturing Review and Industrial Record*, which is described in that journal, and has been proved in practice to be efficient.



The accompanying cut shows the outline section of the most important part of the apparatus. A is a tube supplied with steam from a flask or boiler; F is connected with the exhaust of the filter. By the action of the steam jet identical with that known as the "exhaust" in the locomotive, a vacuum is produced in B, C. By sliding the tube, A, back and forward in the cork, B, an adjustment can be given to the outlet within D, so as to secure the best effect.

The conditions of best effect here are identical with those in the inner nozzle of the Giffard injector when it is starting its water supply from a lower level, and no doubt the proportions found most efficient in that instrument will prove also in this.

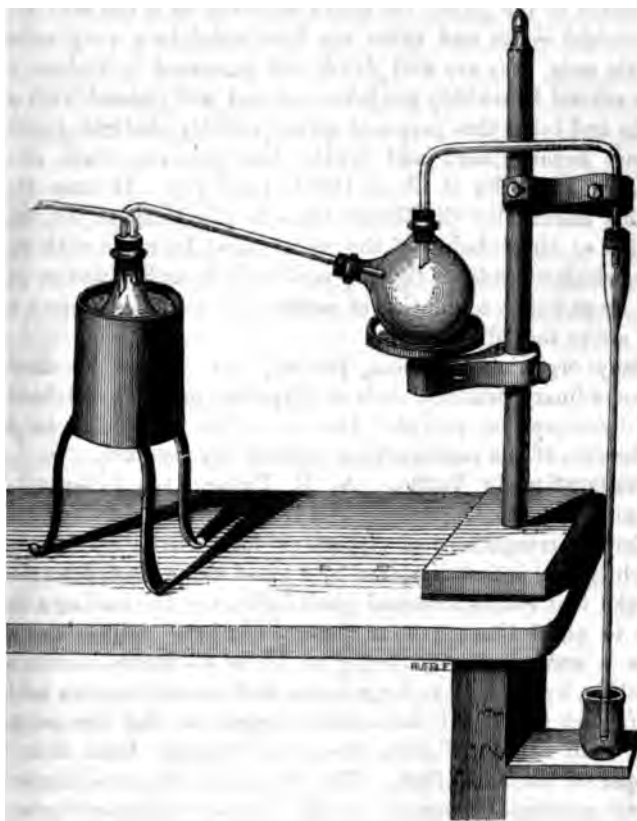
Distillation in Partial Vacuo. (*Pharm. Journ.*, 3rd series, i., 8 from *Commentar zur österreichischen Pharmacopoe.*) The vessel in which the liquid is to be distilled may be either a flask or a tubulated retort, with a narrow neck fitting into a large, tubulated globe. Bend a glass tube twice at right angles, pass the short leg through the tubulus of the globe, and the long leg by means of an india rubber cork into a wide tube holding about 100 c.c., and terminate in a very narrow tube at least 30 in. long; the lower end of the long tube to dip into a mercury trough.

Fit a bent tube into the flask or tubulus of the retort, and draw it out at a point outside the retort; attach a carbonic acid apparatus to this tube, and pass carbonic acid through the apparatus to expel all atmospheric air, or until the gas escaping from the long tube the other end is completely absorbed by a solution of caustic potash. Now seal the tube by which the carbonic acid entered the narrow point, pour about 100 c.c. of caustic potash lye on mercury, and lower the trough until the tube dips into the lye.

Gently warm the globe, to expel a few gas bubbles; on cooling the potash solution will rise to the widened part of the tube, and

the trough must be raised so that the tube dips into the
ry.

absorption of the carbonic acid by potash produces a partial



m, indicated by the rise of mercury in the long tube, which at
me time shows that all the joints are air-tight.

column of mercury must remain stationary for some time at
ght of 15 in. above the surface of the mercury in the trough,
the liquid in the retort will be under a pressure of only half
nosphere.

m heat the retort and well cool the globe.

use of an air-pump supersedes the potash apparatus. A **T**
s introduced instead, one leg of which is connected with the

air-pump, to draw out the air before and after the distillation, second leg connects the globe, and the third is attached to a tube dipping into mercury.

The success of the operation entirely depends upon the absolute perfection of the joints, for which india-rubber is the best material. Vulcanized corks and tubes are first boiled in a weak solution of caustic soda, they are well dried and immersed in molten tallow; after several hours they are taken out and well cleaned with alcohol. Corks and tubes thus prepared make perfectly air-tight joints, they do not become hard and brittle, but preserve their elasticity. India-rubber melts at about 150°C . (302°F). In case the heat applied during the distillation exceeds this temperature, the connection at the tubulus of the retort must be made with a soft cork, which is made air-tight by soaking it in molten wax or paraffin and by painting a solution of caoutchouc in chloroform over the part above the tubulus.

Many organic substances, partially decomposed by distillation under ordinary pressure, such as glycerine, may be volatilized without decomposition, provided the receiver is well cooled to prevent the tension of the vapours from exerting any pressure.

Evaporation in Vacuo. A. B. Prescott. (*Pharm. Jour.* 3rd series, i., 115, from *Amer. Journ. Pharm.*) The author describes a simple arrangement of apparatus for evaporation in vacuo, in which the air is first displaced by a jet of steam, as follows:—

Take two round-bottomed glass flasks, the one having a capacity four to eight times greater than the other. Adjust the smaller upon a water-bath, the larger at 10 to 15 inches distance from the other, over a sink or large basin, and connect the two with tubing and perforated caoutchouc stoppers, so that the connecting tube shall incline slightly downward from its bend close to the stopper of the small flask. The stopper of the small flask must have a second perforation, in which is fitted a straight glass tube two or three inches long, its lower end placed even with the lower end of the stopper. The upper end of this tube is very finely drawn out for a quarter of an inch, and snugly fitted with a piece of firm rubber tubing, the upper half inch of which is closed by a piece of glass rod of same diameter as the body of the tube.

Now put an ounce or two of water in the large flask; place the material to be evaporated in the small flask; close the flasks perfectly by turning the flasks under them, and leave them over the water-bath. Apply, by the water-bath, the limited degree of heat until it is imparted to the contents of the small flask; then

a lamp under the large flask until the water in it has boiled briskly, and the steam therefrom has escaped continuously from the straight tube for some minutes. Now close the straight tube with its caoutchouc cap, at the same time removing the lamp from the large flask. When the latter has cooled somewhat, wrap it smoothly with linen netting or gauze, and lead upon it a minute stream of cold water, controlling the same as required. The liquid in the small flask boils briskly (if aqueous, boiling at 120° or 150° F.), and the refrigeration is governed to prevent too violent ebullition, lest liquid be thrown into the connecting-tube; the degree of applied heat is governed to the same end.

An ordinary glass retort may be substituted for the small flask as an evaporating vessel, and its tubule may be fitted with a perforated stopper, admitting a thermometer. If there is not room in the stopper (of retort or flask) for both the thermometer and the steam-escape tube, the latter may be dispensed with by adjusting the stopper loose for escape of steam, and pressing it tight when the air is expelled. Flat-bottomed flasks favour equable boiling, but they are liable to collapse.

As a condenser, the author has used, instead of the large flask, a copper vessel, for more ready application of heat without danger of breaking, and for more efficient refrigeration. This copper receiver is made of conical shape, with rounded bottom, a vertical diameter twice its horizontal diameter, and a neck bent to the angle of about 50° with the vertical axis of the vessel. The diameter of the neck is three-quarters of an inch, to receive a retort beak, the joint being covered with a section of caoutchouc tubing. Or it may be fitted with a perforated stopper, to receive the connecting-tube of the flask when evaporation is conducted in the latter.

With linen netting to spread the water over the free surface of the condensers, the evaporation therefrom refrigerates with a comparatively small supply of water. Using a copper condenser of the above-described shape, a vertical diameter of 12 inches, and capacity of 6 pints, attached to an 8-ounce glass retort containing distillation promoters, 4 fluid ounces of water have been evaporated in sixteen minutes at the constant temperature of 128° F. By ordinary care in the expulsion of air and closure of the apparatus, exhaustion can be invariably secured, fixing the water-boiling point at below 130° F.; that is, atmospheric pressure equal to at least 25 inches of mercury may be removed and sustained by availing ourselves of the displacing effect of steam, and the contraction of condensing vapour, in very simple apparatus.

This apparatus has been employed chiefly in such evaporations are performed for the residue only, or, at least, not for the quantitative recovery of the distillate, in various evaporations of quinine analysis, in the elimination of non-volatile alkaloids, in determining the organic matter in water, and in preparing fluid extracts.

A Practical Battery for Electro-Therapeutists. E. H. W. (Pharm. Centralhalle, 1871, p. 101, from *Boettger's polyt. J.*) The author has had in operation for eighteen months a battery is to-day just as effective as when first taken into use. It is composed of elements which are modifications of Leclanche's elements. Each element consists of a cylindrical glass of about five inches in height contains a zinc cylinder within the latter there is a clay cylinder, which again contains a layer of coke an inch higher than the clay cylinder. The space between the coke plate and the clay cylinder is filled up by rough pieces of cinder of about the size of large beans, and the interstices left between these cinder pieces are filled up by pure, finely powdered manganese dioxide. This latter substance is to counteract the polarization of the zinc which function it however fulfils only to a small extent. As the zinc is a conductor, both for coke and zinc, a 30 per cent. solution of sal ammoniac is employed; solutions of 20 and of only 10 per cent. are however sufficient in many cases. The upper end of the coke plate is saturated with wax or paraffin. The author then gives some directions as to the uniting of several elements, etc., which, perhaps, need not be given here. It is to be remarked that these batteries can be used where a closed current is required for a long time, on account of the increasing polarization. But where currents of short duration only are wanted, the above elements will answer the purpose well. If then the precaution is observed to open the circuit as soon as the battery has done its required work, the battery is found to last a very long time.

PHARMACY.

PART III.

PHARMACY

Cantharidis. C. R. C. Tichborne. (*Pharm. Journ.*, 1, i., 501.) The vinegar of cantharides, if made strictly to the Pharmacopœia, is a very pungent liquid, having a sour. The specific gravity at 15° C. ranges from 1·060 to 1·065; it should be miscible with water in all proportions. The heat in the maceration is conducive to the solution of cantharides. See remarks upon liquor epispasticus, page 382, and the formula of cantharidine, page 318.)

In the formula of the Pharmacopœia, 12 fluid ounces are got by distillation, and 3½ ounces by pressure, so that 2 ounces of glacial ounces of acetic acid are consumed. It directs that cantharides should be used, but it will be found more difficult that the flies should be simply bruised, particularly when large quantities. The substance of the flies is easily perverted by the acid, whilst the structure generally gets into such a state from its action, that it is difficult to manipulate with quantities of powder.

The relative strength of the present preparation to those formerly given :—

Total Crystallisable Acid. Per cent.	Glacial Acid, etc. (sp. gr. 1·065). Per cent.	Acetic Acid, (sp. gr. 1·044). Per cent.	Cantharides. Per cent.
39·7	10	90	10
37·0	—	100	10
43·75	25	75	17·5
		(Sp. gr. 1·034.)	Euphorbium 2·5 per cent.
46·4	20	80	20

The Pharmacopœia has the following note in connection with the use of these preparations :—"This preparation is rather stronger than acetum cantharidis of the London Pharmacopœia; it is less than the preparations ordered under the same name in the French and Dublin Pharmacopœias;" in fact, as will be seen in the first and fourth columns, these two preparations are almost

identical. The percentage of flies could be increased with great advantage.

Aromatic Sulphuric Acid. J. W. Ehrman. (*Amer. Journ. Pharm.*, xliii., 123.) The author recommends the following formula for preparing an elixir of vitriol:—

Sulphuric Acid	3 troy ounces.
Fluid Extract of Orangepeel	1 fl. oz.
Red Rose Leaves	2 drachms.
Boiling-water	1 fl. oz.
Alcohol	a sufficient quantity.

Add the acid gradually to half-a-pint of alcohol, and pour the boiling water upon the rose leaves; when both liquids have become cool unite them, add the fluid extract and sufficient alcohol to make up the measure to eighteen fluid ounces, mix thoroughly and filter. Elixir of vitriol thus prepared has a pleasing aromatic odour and flavour, and the beautiful red colour of the rose leaves is heightened by the presence of the acid. It is miscible with water without turbidity, and a specimen, after long keeping, has deposited but a trace of sediment.

The Waters of the British Pharmacopœia. G. Brown. (*Pharm. Journ.*, 3rd series, i., 241.) The author makes the following notes on these preparations:—*Aqua Anethi*.—1 lb. of the fruit yields from 3 to 7 drachms of oil, sp. gr. '90. In a note to his translation of the P. L., Phillips says that this oil is soluble in 1500 parts of water; if so, it is evident the proportion of fruit or oil is excessive in the B. P. form. This is a fact, and, if maceration before distillation had been ordered, the quantity might have been halved and a superstratum of oil still obtained.

Aq. Flor. Aurant.—the foreign preparation, with which a syrup is made, often substituted for syr. capillaire. The tests given for this water should have Gobley's test, *Pharm. Journ.*, Ap. 66, added to them; this test detects orange leaf and oil of neroli water. 1 lb. of orange flowers yields about 3ss. of oil, sp. gr. '88.

Aq. Camphoræ.—If the camphor is beaten in a mortar without spirit, it can be reduced to a coarse powder, incapable of sifting through the muslin, but sufficiently fine to make the water quickly.

Aq. Carui is very similar to aq. anethi; both preparations are reduced in quantity from the P. L., and by the adoption of maceration previous to distillation, might still further be reduced. 1 lb. of caraway fruit yields 3iij. to 3x. of oil, of sp. gr. '94.

Aq. Cinnamomi is slightly altered in proportions from the B. P.

Using the bark we are not so likely to use cassia. Pareira says these barks may be known apart by the iodine reaction, but the oils are not so easily distinguished. 1 lb. of cinnamon yields 3i. to 3iij. of oil, sp. gr. 1·006.

Aq. Fœniculi comes from Scotland; possibly Englishmen are not yet alive to its value, as it is not much in request amongst us. 1 lb. of fennel yields 3ij. to 3vj. of oil, sp. gr. ·94.

Aq. Laurocerasi has been investigated by Draper, Pooley, and others. It is one of the most uncertain articles in the Pharmacopœia. Draper advised standardising its hydrocyanic acid; a weak solution of hydrocyanic and sulphuric acids has been praised by others; some say make a stronger water and dilute when wanted; others omit the maceration process; so altogether it is a dangerous and uncertain article. The oil varies from ·06 to ·6 per cent. (Umney).

Aq. Menth. Pip. and *Aq. Menth. Vir.* represent the Labiates. They are the only waters made from oils, as recommended by Haselden, and are improvements on the herb-distilled waters of the P. L. The oil should be divided by trituration with some solid before it is put in the still.

Aq. Pimentæ has been reduced $\frac{1}{8}$ th, that is, 2 oz. less pimento to the gallon. A thin layer of oil lies at the bottom of the water; this opaque water becomes clearer by age, and deposits crystals, to be afterwards noticed. 1 lb. of the berries yields 3ij. to 3v. of oil, sp. gr. 1·02.

Aq. Rosæ, ordered to be made from rose petals, is often made with otto or rose geranium oil. Real otto is a scarce article, 100 lb. of petals yielding less than 3iij. of solid otto fusing at 86°. The salt process will be referred to presently.

The last water of the Pharmacopœia is *Aq. Flor. Sambuci*; this, as well as *aq. rosæ*, the B. P. allows to be made from the salted flowers. The author has found the use of salt unsatisfactory and injurious. Often after salting and keeping in a cool dry place, he has found that before the next flower-season came round an odour of chlorine and sawdust was developed by distillation. The metal still was corroded; the water smelt like a dilute solution of chlorine, and precipitated argentic nitrate; the salting process was therefore discontinued, and a stronger water distilled and diluted when wanted. This water was found to keep. Elder-flowers yield scarcely ·32 per cent. of a volatile oil slightly lighter than water, solid, and with a powerful smell of elder-flowers even when largely diluted.

With reference to the preparations of waters from the essential oils without distillation the author states, that if a small tube, con-

taining an essential oil, is placed in water in a position opposite to the specific gravity of the oil, and the ends of the tube are closed with membrane, vegetable parchment, etc., exosmosis of the oil commences, and in twenty-four hour or forty-eight hours the water is saturated, and may be drawn off and replaced by a fresh portion. This is not proposed as a plan in opposition to distillation, it is too long in operation perhaps, but as a convenient way of making those waters only wanted occasionally, and which are frequently made by rubbing down the oil with some other substance.

Aqua Amygdalarum Amararum. Dr. Th. Rieckher. (*Pharm. Centr.*, 1871, p. 161). After the oil has been pressed out from bitter almonds, the remaining cakes are submitted to distillation. The latter operation may be performed in two ways: the one, the older method, consists in digesting the cakes with cold water and then distilling the mixture; the other, proposed by Pettenkofer, consists in introducing the bitter almond bran into boiling water (in order to coagulate the emulsion), adding to it emulsion of sweet almonds (to decompose the dissolved amygdalin), and then distilling. To determine which of the two methods is the more advantageous, it is necessary to compare only such experiments as have been made under quite the same conditions, and, of course, in practical good vessels. The author then gives the numerical details of two parallel experiments, the result briefly of which is that Pettenkofer's method is the better one; a certain quantity of bitter almonds yielding by 100 parts of prussic acid, whilst the same quantity distilled according to the older method gave but 94·4 parts of prussic acid.

Vesicating Collodion. C. R. C. Tichborne. (*Pharm. Journ.*, 3rd series, i., 501). The author recommends as a good process for preparing vesicating collodion, to dissolve about a quarter of an ounce of gun-cotton in ten fluid ounces of liquor epispasticus prepared with glacial acetic acid as described by the author. (See page 383.)

Collodium Mercuriale. (*Pharm. Zeitung.*, 1871, no. 5.)—

Collodion	30 grammes.
Terebinth Venet.	1·5 „
Hydrarg. Bichlor.	0·3 or 0·5 „

Morphia Collodion. A preparation under this name is recommended in "*L'Union Médicale*," as an application for neuralgic pain. It is made in the proportion of 1 part of hydrochlorate of morphia to 30 parts of flexible collodion, and is applied by means of a camel's-hair brush.

Infusion of Senna. J. W. Ehrman. (*Chicago Pharm.*,
) The author recommends the following formula for this con-
n:—

℞ Tamarinds	20 parts.
Figs, bruised	20 "
Prunes, sliced	15 "
Fluid extract of Senna	10 "
" " Ginger	1 "
Sugar	30 "
Water a sufficient quantity.	

gest in a close vessel, by means of a water-bath, the tamarinds,
and prunes in 10 parts of water, for three hours; separate the
er portions with the hands, and press the pulpy mass by rub-
first through a coarse sieve, and then through a very fine one.
the residue with 4 parts of water, and, having digested the
are for a short time, treat it as before, and add the product to
ulpy liquid first obtained, evaporate to a syrupy consistence
a water-bath, add the sugar, and continue the heat for twenty
tes, or until the sugar is dissolved; then remove from the bath,
he fluid extracts of senna and ginger, and mix thoroughly.

Copaiba Jelly. (*Lancet*, 1871, i., 570.) At a clinical lecture
ered by Mr. Berkeley Hill, in University College Hospital,
hibited a new preparation of copaiba in the form of a jelly,
h he said was taken by his patients readily. It was bright
almost as firm as calf's-foot jelly, very attractive by its
red colour to the eye, and not repulsive to the palate, its flavour
masked by peppermint. It contained 50 per cent. of copaiba.
ce as large as a filbert, rolled in wafer-paper, might be swallowed
out being tasted at all. The after effects of nausea, diarrhoea,
are not more than, if so frequent as, from other preparations of
ba. The specimen had been prepared by Mr. Martindale, dis-
ar to the hospital, according to the following formula, which
an improvement made by him upon the original one:—

℞ Thick Copaiba	℥viij.
Powdered Sugar	℥iv.
Honey (not crystallised)	℥iv.
Distilled Water	℥v.
Oil of Peppermint	℥j.
Roseine (dissolved in mxx. water)	℥v gr.

at the honey, sugar, copaiba, and water into an evaporating dish.
ping it well stirred, heat the mixture gently till it boils, and

continue the agitation and ebullition about five minutes. In the first part of the operation two distinct strata are formed,—the upper, the copaiba; the lower, the honey, etc. As the water is evaporated, numerous bubbles of steam are given off, just as the whole becomes a homogeneous jelly. When it has partly cooled, stir in the roseine and oil of peppermint. When well made, it should resemble raspberry jelly. Should this very minute quantity of roseine (one of the aniline pigments) be objected to, an ammoniacal solution of carmine gives a very good colour.

Emulsion of Almonds. H. P. Reynolds. (*Amer. Journ. Pharm.*, xliii., 53.) The official emulsion of the U. S. P. forms an elegant and suitable vehicle for the administration of many pungent or acrid medicines, but no apothecary cares to spend time for its extempore preparation, and of course it cannot be kept on hand on account of the readiness with which it ferments.

Experimenting recently, by the request of a physician, for a satisfactory vehicle for chloral hydrate, the author found the emulsion of almonds peculiarly adapted to the purpose, both by reason of its agreeable taste and its thick consistency almost completely obscuring the pungency of the drug. Chloral is now so largely administered in that class of diseases accompanied by an irritated and sensitive condition of the mouth and throat, that this seemed a point gained. And it may not be amiss to state here that syrupus acaciæ, slightly flavoured with orange-flower water and essential oil of almonds, is a very agreeable vehicle for the chloral.

Finding it would be necessary to provide the emulsion for this purpose, it became desirable to have it on hand in a convenient and permanent form. The author, therefore, contrived a preparation which he calls a "Concentrated Emulsion of Almonds," and which is prepared as follows:—

℞ Sweet Almonds (blanched), Sugar, Glycerine ("C. P.")	each 1 oz.
Powdered Gum Arabic	1 drm.
Water	2 oz.

Rub to a uniform paste, strain through muslin, and evaporate by a heat not exceeding 150° F., to the consistency of a fresh solid extract. Preserve in wide-mouthed bottles of size for convenient use. It may be flavoured to suit; the author has preferred orange-flower water and oil of almonds. When emulsion of almonds is prescribed, it is readily prepared as follows:—

- R.** Concentrated Emulsion 2 drms.
 Water sufficient to make one ounce of the mixture,—
 mix thoroughly.

It immediately assumes the milky hue and consistency of the official article, and cannot be distinguished from it, while it keeps without change and without drying.

On the use of Liquid Caoutchouc, as an addition to Emp. Belladonna and other Plasters. J. Willetts, Worthington. (*American Journ. Pharm.*, xliii., 153.) The author has treated this subject at some length in his Inaugural Essay before the Philadelphia College of Pharmacy, from which we abstract the following:—

Much difficulty has been experienced by pharmacutists, in preparing belladonna plaster, so as to retain its adhesiveness when kept ready-spread for some time. The proposed improvement consists in the addition of india-rubber, used in the form of a solution, made as follows:—

- R.** Pure Caoutchouc, cut in small pieces . . . an ounce.
 Benzine (from Petroleum) a pint.

Macerate with occasional agitation in a suitable stopped wide-mouthed bottle, until a thick saturated solution is obtained. To prove its efficacy in preserving the pliability of plasters, the author prepared a mixture of 3 ounces of Burgundy pitch, 4 drachms of yellow wax, 2 drachms of resin, and 2 drachms of lard, melted and strained. This, when spread and kept two months, became very brittle, and cracked on handling.

The same ingredients, with the addition of 4 drachms of liquid caoutchouc incorporated when they were in a fused state, possessed the following characters:—

Very little tendency to crack, retains its pliability, is more adhesive, and has a beautiful, smooth, glossy appearance. After two months, part of it very cold weather, this plaster retained its pliability.

Experiments were then made with official belladonna plaster, which resulted in the following proportions being considered most suitable:—

- R.** Belladonna Plaster (U. S. P.) 7 drms.
 Liquid Gum Elastic 1 drms.

The belladonna plaster to be melted by a water-bath, and the liquid rubber then added and stirred well until united thoroughly.

The odour of the benzine disappears when the solution is added

in this way. It is quite important to avoid an excess of heat, and hence the water-bath is recommended.

Liquid rubber will be found to act admirably in all plasters which may be made to keep through the summer.

Extract of fresh Conium Fruit. J. Harley, M.D. (*Practitioner*, 1870, No. 30, 332.) In an able and exhaustive paper Dr. Harley records the results of a continuation of his researches on the comparative value of the different preparations of conium.* He draws the following conclusions from his experiments:—

That the superiority of the green fruit over every other part of the plant, as the basis of the tincture and extract, is clear and decided. He considers the Pharmacopœia extract to be a scandal to the present state of medical knowledge, and that, as soon as possible, a spirituous extract of the green fruit should take its place.

That although the variability in strength of the succus is a drawback, this might be, in great measure, removed by the cultivation of the plant for medicinal use. At present, the wild plant is gathered as soon as it makes the least show of flowering, instead of being allowed to remain until the fruit begins to form. The tincture employed by him was prepared by macerating the fresh, undried, crushed, annual fruit in proof spirit, and percolating. Six ounces yielded 26 ounces of tincture. The extract was prepared by evaporating the tincture to dryness over a water-bath. One thousand grains measures yielded 20 grains of bright yellowish-brown brittle extract, which became soft on exposure, from absorption of about 15 per cent. of water, and formed a translucent extract of the colour of Cape aloes. Treated with excess of potash, it assumed a gamboge colour, and evolved a powerful odour of conia.

Extractum Physostigmatis. C. Fredigke. (*Pharmacist*, iv. 75.)

R. Calabar Beans 1000 grammes.
Alcohol of 0·864 5000 grammes.

Reduce the beans to a fine powder, digest with a litre of alcohol over a water-bath, which must be maintained at a gentle heat for two hours. Then introduce the mixture into a displacement cylinder; and when the liquor which results from this digestion ceases to run, pour over the powder a second litre of boiling alcohol, and continue in this manner till the liquor passes off colourless. Mix the solutions, distil off the greater portion of the alcohol, and evaporate over a water-bath to the consistence of an extract. It is necessary

* See *Pharm. Journ.*, 2nd series, vol. viii., pp. 413, 452, 572, 601, 710; ix., 471.

to stir constantly towards the close of the operation, in order to make the product homogeneous.

One thousand grammes of Calabar beans furnish from 25 to 30 grammes of extract, having a pilular consistence.

What is above is the process for the preparation of this extract adopted in the French Pharmacopœia.

It Extract. A. E. Ebert. (*Chic. Pharmacist*, iii., 241.) The author gives the following process for the preparation of an extract similar to that which usually bears the name of Liebig in commerce.

R. Barley Malt, kiln dried 10 lbs., av.
Water a sufficient quantity.

Barley malt can be obtained at the malt-houses or breweries by the following process: reduce it by means of the drug-mill so that it will pass through a No. 20 sieve, and add to the meal a sufficient quantity of water to form with it a soft dough; then add about two gallons of water, and apply heat so as to raise the temperature of the mixture to 150°, or not to exceed 158°. Maintain this temperature, with occasional stirring, for several hours, or until the whole of the malt is converted (by means of the diastase of the malt) into dextrine and glucose. The absence of starch can be ascertained by the application of iodine to a small quantity of the liquor; when, starch has been wholly converted, no blue colouration will be perceptible. Then express the liquor rapidly, and pass it through a coarse strainer. This is the most difficult part of the process, as it speedily clogs the strainer; this can be averted to some extent by making a pulp of the malt by means of water, from common unsized paper, or filtering the liquor by means of water, from common unsized paper, or filtering the liquor; and mixing this pulp with the expressed liquid previous to filtering. The perfectly clear fluid is finally to be evaporated, by means of a water-bath, to the consistence of a thick syrup, having sp. gr. 1.500, or approximately one pint, weighing 1½ lbs. av. The extract has an agreeably syrupy taste, and contains, besides sugar of the malt, dextrine, albumen, and the phosphates of the malt. In very hot summer weather it is liable to go into fermentation, but this can be prevented by the addition of a small quantity of salicylic acid.

Phlocarbonic Extracts. M. Lefort. (*L'Union Pharm.*, 1870, p. 30.) The author directs attention to some researches of M. Lefort, showing that by means of sulphide of carbon, extracts from various flowers can be prepared in which the perfume of the flowers is perfectly preserved. He therefore proposes to prepare extracts of

certain medicinal plants, such as belladonna, henbane, conium, etc., by means of sulphide of carbon; and he states that the preparations so obtained retain, in a remarkable degree, the medicinal activity of the original substance, and are peculiarly adapted for making medicated oils, ointments, etc.

The sulphide of carbon used for this purpose is purified by washing several times with water, then mixing it with one per cent. of its weight of sweet almond oil, and distilling. The product which comes over possesses the aromatic odour characteristic of pure sulphide of carbon. To prepare the extract, one part of the finely-powdered substance, which has been *carefully dried* at about 50° or 60° Cent., is macerated in a close vessel with three parts of sulphide of carbon for one or two days. The clear liquid is decanted, and the maceration repeated once or twice with fresh portions of the same menstruum. These solutions so obtained are mixed, filtered, and distilled from a retort, which is heated by immersing in a bath of water maintained at a temperature of 50° to 55° C. The end of the condensing tube is made to dip a short distance beneath the surface of water, whereby most perfect condensation of the sulphide is ensured. The distillation at this temperature proceeds quickly and easily; and when most of the sulphide has passed over, the residue in the retort is transferred to a dish, and heated by a water-bath until the odour of the sulphide of carbon has passed off. The extract so obtained possesses a very strong odour of the plant from which it has been obtained. When the distillation has been conducted at the low temperature indicated, the sulphide of carbon carries over with it none of the odorous principle of the plant, and may be used over and over again for different substances indiscriminately. The exhausted mass retains about half its volume of the menstruum, which may be recovered by distillation.

The author has obtained from 100 parts of the following substances, in a state of impalpable powder, the following proportion of extract:—

Leaves of digitalis	2.89
„ belladonna	3.06
„ henbane	3.24
„ stramonium	2.96
„ aconite	3.21
„ conium	3.18

These extracts contain:—1. A fatty matter. 2. Chlorophyll, which is dissolved in the fat; this green colour is very intense, a minute

proportion of the extract being sufficient to give a very decided colour to any oily or fatty substance. 3. The odorous principle of the plant, which is also very powerful, even when much diluted. 4. The several organic bases derivable from the original substance. Their consistence is buttery, and they stain paper like a fat. The author has recognised by chemical tests the presence of atropine and aconitine in the extracts of belladonna and aconite, and has proved their medicinal activity by experiments upon animals.

These extracts are very soluble in oils and fats; and as they are shown to contain the active principles of the plants from which they are derived, they are peculiarly adapted for the preparation of ointments and medicated oils.

To prepare the medicinal oils, the author proposes to dissolve one part of the extract in 200 parts of olive oil. The extract is first warmed on the water-bath with a small portion of the oil, and then the remainder is added. If the extract has been well prepared, a complete solution is obtained in a few minutes, and the product possesses the odour and activity of the plant.

The author has also prepared a sulphocarbonic extract of chamomiles which possesses all the characteristic odour of the flowers. One hundred parts of the flowers yield five parts of a semi-solid extract.

Glycero Extracts. H. Duquesnel. (*L'Union Pharm.*, 1870, xi., 257.) The author proposes to introduce into pharmacy a class of preparations which he names glycero-extracts. They are so prepared as to be half the strength of the ordinary vegetable extracts; that is to say, they contain 50 per cent. by weight of glycerine. They are of the consistence of very thick syrups, and may be preserved for any length of time without change. The glycero-extracts of the fresh plants, such as belladonna, henbane, conium, etc., are prepared by expressing the juice from the recent herb in the usual way, boiling to remove the albumen and chlorophyll; and then after filtration, adding the right proportion of glycerine, and evaporating down to a given weight. In the case of belladonna, the author states that 20 grammes of glycerine should be added to the juice from one kilogramme of herb; and the liquid reduced by evaporation to 40 grammes. But the more exact method of proceeding, is to ascertain the proportion of dry extract which the clarified juice will yield, by evaporating a small known quantity in a porcelain capsule to dryness, over the water-bath; and then, having weighed this, to add glycerine to the remainder of the juice in the same proportion, and evaporate until the weight equals twice that of the dry extract. These pre-

parations can be usefully employed in ointments, plasters, suppositories, liniments, etc.

The glycono-extract of gentian is prepared by macerating the root in water, boiling the infusion, and removing the coagulum by filtration, then adding 216 grammes of glycerine for every kilogramme of root employed (this being the quantity of dry extract usually yielded by that quantity of root), and evaporating until 432 grammes of product are obtained for every kilogramme of root. The extracts of rhatany, rhubarb, etc., are prepared in the same manner.

Thus the glycono-extract of opium is obtained by exhausting the opium with water, and adding to the infusion a quantity of glycerine equal to that of the dry extract which would be obtained from the infusion, and evaporating, until the product has twice the weight of the glycerine added.

The glycono-extract of ipecacuanha is prepared by dissolving 100 parts of the hydro-alcoholic extract of the French Codex in eight times its weight of water, filtering, adding 125 parts of glycerine, and evaporating until 200 parts of product are obtained. This preparation is very useful for preparing a syrup of ipecacuanha. It is only necessary to mix 20 grammes of the glycono-extract with 980 grammes of simple syrup. 20 grammes of this syrup represent 20 centigrammes of the officinal extract.

These glycono-extracts undergo no change by keeping, and are particularly valuable where it is desired to obtain a solution of any vegetable extract.

Fluid Extracts. J. W. Mill. (*Chic. Pharmacist*, iii., 228.) Fluid extracts occupy a most important position in American pharmacy. The United States Pharmacopœia includes a considerable number of these preparations. They are generally prepared by percolation, and brought to such a strength that one pint represents sixteen troy ounces of the drug. In consequence of the great amount of time, and labour necessary for their preparation, and the waste of alcohol involved in the process, it has been recently proposed to reduce the strength of fluid extracts generally to one-half. The author of the present paper objects to the adoption of this course, and considers that by suitable modification the processes may be rendered more practicable and sufficiently easy of execution.

He thinks an alteration might be made in the degree of fineness to which the Pharmacopœia directs the drug to be pulverised. Instead of bringing the drug to a uniform powder that will pass through a sieve of fifty meshes to the inch, he recommends to grind it as fine as possible, and sift it successively through sieves 20, 40,

and 60 meshes to the inch, repeating the operation two or three times, or so long as any fine powder is obtained. In packing for percolation the powders are arranged in the order of their fineness, commencing with the finest—thus exposing the least permeable portions of the drug to the most solvent portions of the menstruum, and also ensuring a slow rate of percolation, so essential to a successful result. Operating in this way, perhaps a little more menstruum is required, than if the drug were in “moderately fine” powder, as directed; but then the process is brought within the range of practicability.

The following formulas illustrate the ideas of the writer on this subject:—

Extractum Buchu Fluidum.

℞ Buchu	16 troy ounces.
Glycerine . . . . .	.4 fluid ounces.
Alcohol and Water	sufficient.

Grind the buchu, and sift it successively through No. 20, No. 40, and No. 60 sieves, keeping the result of each sifting separate. Mix the glycerine with twenty fluid ounces of the alcohol, and with five fluid ounces of this menstruum moisten the different lots, and introduce them successively into the percolator, commencing with the finest; pack firmly, and gradually pour on the remainder of the alcohol and glycerine, following it with a mixture of alcohol and water in the same proportion, till the drug ceases to absorb any more, and the menstruum remains permanently on the surface; then having closed the orifice of the percolator with a cork, and put on the cover, set aside to macerate. At the end of twenty-four hours, or longer, remove the cork, and allow the percolation (which should not be faster than ten drops per minute) to proceed. When the liquid has disappeared from the surface, pour on menstruum till twelve fluid ounces of percolate have passed; set this portion aside, and continue the percolation with the remainder of the menstruum, and finally water, till the buchu is exhausted, or until two pints more of percolate have been obtained. Concentrate this by distillation in a water-bath still till reduced to four fluid ounces, and mix it with the reserved percolate. Allow the mixture to stand for twenty-four hours, and filter through paper.

The menstruum employed in this formula, is less alcoholic than the Pharmacopeia directs; but it is sufficiently so to extract and retain in solution the active principles of buchu. The glycerine seems to prevent the separation of resinous matter, which occurs

during distillation, when a purely alcoholic menstruum is employed. In the unfiltered fluid extract, no deposit had occurred after the lapse of several weeks.

Extractum Cinchonæ Fluidum.

℞ Cinchona, yellow	16 troy ounces.
Alcohol	4 pints.
Glycerine	8 fluid ounces.

Grind and sift the cinchona in the same manner as directed for buchu, mix the glycerine with three pints of the alcohol, and with six fluid ounces of the menstruum moisten the cinchona, and pack moderately in a glass percolator; pour on the balance of the alcohol and glycerine, and then the remaining pint of alcohol, following it with water, till about four pints of percolate have been obtained. Put the percolate into a water-bath still, and distill off the alcohol till reduced to the measure of sixteen fluid ounces.

Extractum Hyoscyami Fluidum.

℞ Henbane Leaf	16 troy ounces.
Glycerine	4 fluid ounces.
Alcohol and Water	each a sufficient quantity.

Mix the glycerine with twelve fluid ounces of alcohol and eight fluid ounces of water, and with six fluid ounces of this menstruum moisten the henbane previously prepared for percolation. Pack firmly in a cylindrical glass percolator, and pour on menstruum till the surface remains covered; macerate for twenty-four hours, then proceed with the percolation, using the remainder of the glycerine menstruum, dilute alcohol and water successively till at least three pints of percolate have been obtained. Of this, reserve the first twelve fluid ounces, and distill the remainder in a water-bath still till reduced to eight fluid ounces; to this add the reserve percolate and continue the distillation till reduced to such a point that, when cold, the finished fluid extract shall measure exactly sixteen fluid ounces.

In the same way prepare fluid extract of senna, uva ursi, spiræa, sarsaparilla, dulcamara, serpentaria, taraxacum, and gentian.

Extractum Rhei Fluidum.

℞ Rhubarb	16 troy ounces.
Alcohol, Diluted Alcohol	each a sufficient quantity.
Glycerine	4 fluid ounces.

mix two fluid ounces of the glycerine with fourteen fluid ounces alcohol, and with six fluid ounces of this moisten the rhubarb pound, and as much as possible of it passed through a No. 40 sieve). Pack moderately in a conical glass percolator, and pour the remainder of the glycerine and alcohol. Macerate for twenty-four hours, then mix the remaining two fluid ounces of glycerine with one pint of alcohol and fourteen fluid ounces of water, and with this and diluted alcohol continue the percolation till first seven fluid ounces, which reserve, and then about two pints more percolate have been received; this latter percolate distill in a water-bath still till reduced to twelve fluid ounces, to this add the reserve percolate, and continue the distillation till reduced to such a quantity that, when cold, the fluid extract shall measure exactly seven fluid ounces.

Fluid Extracts and their Menstrua.* Edward R. Squibb, M.D. (*Proc. Amer. Pharm. Assoc.*, 1870, 101, 161.) In continuation of the subject of Percolation and Economy of Alcohol, annually presented to the association for some years past, the writer offers an abstract of the results of his last year's experience, premising that, as neither the time nor inclination, as time becomes more valuable, to defend his notions, judgment, or accuracy, or even to point out many of the deductions that might be drawn from the statements made as facts.

It is not uncommon to hear observant physicians say that they do not obtain results from the fluid extracts corresponding in the proportion of minim for grain to the drug which they represent; pharmacists who use the official formula must be aware that the drugs are not entirely exhausted by the processes given. A critical inquiry into this subject, in this direction, is the chief object of this paper.

A practical way to measure the rate and extent of exhaustion by percolation has long been needed, and the want of some simple and uniform plan has, perhaps more than any other obstacle, stood in the way of accurate knowledge and progress in the art of percolation. In many trials, some of which were described in previous papers, the method of specific gravity has thus far proved the most satisfactory and successful. But when applied by the hydrometer, or by the ordinary specific-gravity bottle, with the necessary calculations, it is too abstruse and complicated for common usage.

It is to a more plain and simple application of the principle of displacement that the writer has now directed his attention. Read before the American Pharmaceutical Association at a meeting at Baltimore, 1871.

specific gravity that attention is now to be directed, and the formula may be stated as follows:—In percolation the density of the percolate will vary from the density of the menstruum in proportion to the extent and rate of the exhaustion. It follows from this proposition that to measure the extent and rate of exhaustion, it is only necessary to measure the extent and rate at which the percolate varies from the menstruum at the beginning of a percolation and approaches to it at the end, absolute exhaustion being indicated by equal density, or equal weight of the same volume at the same temperature, of the menstruum and percolate. This measuring usefully accomplished with sufficient accuracy by separating the percolate as it passes into successive portions of a pint each, and weighing them. By subtracting from this the weight of a pint of the menstruum at the same temperature, a series of differences will be obtained expressing the extent and rate of exhaustion. When the exhaustion is practically completed (it is never absolutely accomplished), the residue is dried and weighed, and its weight subtracted from the weight of the substance as originally taken for percolation. The difference or loss in weight indicates the total amount of solid matter dissolved and removed by the menstruum. Then, as the sum of the differences in weight between equal volumes of the menstruum and percolate at the same temperature, is to the total amount of solid matter or extract dissolved out by the menstruum, so is each separate difference to the weight of solid extract in the portion of percolate which that difference represents. That is to say, the total weight or amount of solid extract being ascertained, the ratio of the differences in density is applied to it to obtain a ratio of the rate of exhaustion, and to ascertain the distribution of the total extract throughout the percolate.

This method, applied to nearly all the fluid extracts which are at present official, and to some others, has convinced the writer,—

First. That the present official processes do not sufficiently exhaust the drugs to which they are applied; and,

Second. That these processes do not take the best way to attain the object. That the supposed advantage of using coarse powders is a delusion. That maceration is useless at the commencement of the process of percolation, but useful after the substance has been partially exhausted. That the menstrua are not always the best that could be selected, either for extracting the useful portions of the drug or for excluding the useless portions. That glycerine is preferable to sugar where either gives any positive advantage, but that anything like a general use of glycerine in fluid extracts is to

be deprecated, as the advantages are more in appearance than reality.

The following table, embracing the substance of nine official fluid extracts and one other, is limited in extent by the size of the page, but is large enough to illustrate these points. These percolations, excepting ergot and lupulin, were all made with fine powders, moistened with more menstruum than is directed by the Pharmacopœia, and the moistened powder put through a sieve of about twelve meshes to the inch before the packing. The packing and percolating was then done with all the care and skill which the writer's experience could suggest, so that the results are considered to be much better than an average practice would give. Each pint of percolate was weighed in a flask marked in the narrow part of the neck, and the menstruum at the same temperature was weighed in the same flask, and the difference in weight set down in the column under that heading. The same powder, managed in the same way, was percolated at once; and another portion, after macerating four days, with no practical difference in result; whilst a maceration of twenty-four hours after the third or fourth pint of percolate had passed, would always increase the differences somewhat, and would often increase them much. Changes of temperature, also, by changing the solvent power of the menstruum, caused the differences to rise and fall somewhat, coincident with changes of weather. A simple inspection of the proportion of the extract contained in the first pint of each percolate will probably expose the fallacy that any amount of expert skill and management could ever make that pint represent the whole efficacy of the drug. In percolating the powder of good aconite root by a very slow and careful percolation, the characteristic numbing impression upon the tongue was distinctly though faintly perceptible by the application of a few drops from the thirteenth pint. The bitterness of cinchona was perceptible in the seventeenth pint; but neither the taste nor odour of wild cherry bark was perceptible in the sixteenth pint, though the amount of extract contained was large. Ergot was necessarily percolated in coarse powder (No. 60), and was easily and rapidly exhausted; but the dried residue powdered finer gave a notable proportion of extract, which, for want of time, was not determined. Not so with lupulin, however, which, percolated in its natural condition of coarse powder, left a light residue, from which no ordinary management could extract anything more. The percolation of lupulin was very regular and uniform, and maceration at any stage of the process had no perceptible effect.

TABLE OF PERCOLATIONS.

Portion of the Percolate.	Aconite Root.		Buchu Leaf.		Cinchona Bark.		Ergot.		Lupulin.		Wild Cherry Bark.		Sarsaparilla Root.		Senna Leaf.		Dandelion Root.		Uva Ursi Leaf.	
	Grains.	Extr.	Grains.	Extr.	Grains.	Extr.	Grains.	Extr.	Grains.	Extr.	Grains.	Extr.	Grains.	Extr.	Grains.	Extr.	Grains.	Extr.	Grains.	Extr.
1	988	512	305	780	398	514	304	748	705	9276	887	344	325	899	563	1166	808	1927	633	1344
2	1093	343	124	321	155	200	135	332	487	1649	117	180	187	340	286	593	374	492	213	452
3	118	210	87	173	70	80	40	121	187	694	73	87	43	135	103	213	169	403	173	397
4	77	137	44	113	48	62	26	194	133	429	66	70	40	102	46	95	119	293	73	155
5	67	101	27	70	53	68	21	62	77	240	60	72	40	102	47	98	53	196	73	155
6	60	89	20	52	26	34	16	39	64	207	60	72	40	102	36	75	31	16	35	74
7	36	64	10	47	28	35	12	33	39	126	54	65	40	102	34	71	8	16	36	77
8	41	73	19	47	65	84	17	45	26	84	62	74	40	102	33	68	7	17	37	48
9	44	78	18	47	45	123	14	33	23	74	55	66	34	87	31	64			39	42
10	34	61	18	31	71	92	9	22	13	42	53	63	20	51	23	45			16	34
11	31	66	12	31	31	40	8	19	13	42	53	63	12	31	2	4				
12	37	66	9	22	26	34	10	25			57	68			3	5				
13	29	52	3	3	32	41	10	25			52	62			4	6				
14	27	48			32	41					49	59								
15	22	39			25	32					41	50								
16	20	36			38	49														
17																				
Sum Total	1104	1964	684	1770	1205	1575	632	1555	1760	5981	1207	1445	781	1892	1226	2340	1560	3742	1289	2788
Quantity of powder percolated	7623		7680		7680		7680		7680		7680		7680		7680		7680		7680	
Dried residue from percolation	5688		6125		6125		6125		1969		6235		5688		5140		3838		4922	
Loss by percolation (solid ext.)	1964		1555		1555		1555		5681		1445		1962		2540		3742		2758	
Pharmacopoeia percolates to			24 pints.		4 pints.		34 pints.		2 pints.		3 pints.		4 pints.		3 pints.		3 pints.		3 pints.	
Maximum ext. obt. by Pharm.			1340		866		1340		3824		571		1415		1972		3222		3163	
Percentage of total			70 p. c.		55 p. c.		80 p. c.		63 p. c.		40 p. c.		71 p. c.		78 p. c.		86 p. c.		78 p. c.	
Percolate required to get 80 per cent. of total extract	84 pints.		41 pints.		94 pints.		4 pints.		34 pints.		11 pints.		6 pints.		4 pints.		24 pints.		29 pints.	
Extract in the pint when of 80 per cent.	1671		1416		1244		1244		4244		1168		1693		2032		2493		2506	

active percolations of dandelion-root are very slow, and therefore perfect; and like those of sarsaparilla, often become slower they approach completion.

The great difference in the rate of exhaustion in the examples in the table indicates that no general rule of limit can be stated, but that each substance must be studied by itself. From those given in a previous paper, the solid extract obtained by percolation from some drugs, and probably from all, is not of uniform medicinal value as found in different parts of the percolate, becomes weaker towards the end. When this ceases to be of practical value, or in other words, when the percolation should terminate, was not determined. Among the examples given it will be seen that if the Pharmacopœia used fine powder and slow percolation, it would, in the case of dandelion, obtain 86 per cent. of total extract; and it is probable that this is somewhere near beyond the limit of practical utility. If so, it might be directed that fluid extracts as a class of preparations should not contain more than 80 per cent. of the total solid extract which the drugs were capable of yielding to the given menstruum; and the limit of percolation necessary to obtain this is shown by one of the lines in the table. But where this 80 per cent. of the solid extract has been obtained, it is not within the compass of a pint, but is contained in a number of pints, never less than $2\frac{1}{2}$ nor more than 11.

To get these various large quantities within the measure of a pint each without the use of heat, and with the least loss of menstruum, is the next and great requisite, without which they are not fluid extracts.

To accomplish this, there appears to be no choice of means. There is no way, and only one way, known to the writer by which it may be done, and that is by repercolation, or percolating fresh portions of the drug with percolate from previous portions, until the normal difference in weight between equal volumes of the menstruum and percolate is attained.

This process is somewhat complex and troublesome, and requires judgment and skill; and worse than all, requires that a stock of weak percolate of different densities be carried from one making to the next for each fluid extract. But as it appears to be absolutely the only means of accomplishing the end well and properly, there is no choice between it and those means which give results too imperfect for the present state of pharmacy.

This process of repercolation has been described in previous papers, but it may be useful here to offer a table of examples, carried

out to an exaggerated extent, to exhibit its scope and capacity; and yellow cinchona, dandelion, and senna are selected for illustration. All these drugs were taken in the very fine powders as met with in the markets. One Pharmacopœia portion of 7680 grains of each was taken for each percolation, and three percolations of each drug were made. The percolate from the first portion of each was taken to moisten and percolate the second, and the percolate from the second portion of each was taken to moisten and percolate the third.

The menstruum used for yellow cinchona was a mixture of one part, by weight, of glycerine, and three parts, by weight, of strong alcohol. That used for the senna was diluted alcohol, and that used for the dandelion was a mixture of equal weights of stronger alcohol and water. The yellow cinchona and dandelion were each moistened with $8\frac{2}{3}$ of menstruum and percolate, and the senna with 9 $\frac{1}{2}$. The moistened powders were passed through a sieve before packing and were packed and managed alike, each pint as it came from one funnel being poured on top of the other.

It will be seen by reference to the first table that it is estimated that the Pharmacopœia may get in yellow cinchona 55 per cent. of the extract from the bark, or 866 grains in the two pints. By the last cinchona column of the table of repercolations it will be seen that if the first four pints from the third portion be mixed together, each pint of the mixture will contain almost as much extract of cinchona as the officinal two pints, and the whole four pints will make, by adding the next four pints of the column, eight pints, having nearly the strength of the officinal preparation, and this from three portions of powder.

If the fluid extract of cinchona be changed in the new Pharmacopœia to double the present officinal strength, and the standard for percolation be unchanged, then this column would yield about $2\frac{1}{2}$ pints of double the present officinal strength. But if the standard be increased so that the preparation shall contain 80 per cent. of the extract, or 1244 instead of 866 grains, then the first pint of the column is not strong enough, and another portion must be percolated with the percolate from the third portion. This portion may be larger or smaller than the others in proportion to the wants of the operator, and will yield accordingly, the larger portions being more economical.

In the case of dandelion (should not the Pharmacopœia change the English name to taraxacum?) the Pharmacopœia is estimated to get 86 per cent. or 3222 grains of the extract in its pint. This would make the first two pints of the last dandelion column nearly

TABLES OF ASSOCIATIONS.

Portion of Pint.	YELLOW CINCHONA BARK. Grains.						DANDELION ROOT. Grains.						SENNA LEAF. Grains.					
	1st Portion.		2nd Portion.		3rd Portion.		1st Portion.		2nd Portion.		3rd Portion.		1st Portion.		2nd Portion.		3rd Portion.	
	Difference.	Extract.	Difference.	Extract.	Difference.	Extract.	Difference.	Extract.	Difference.	Extract.	Difference.	Extract.	Difference.	Extract.	Difference.	Extract.	Difference.	Extract.
1	338	514	587	757	765	988	808	1927	1484	3539	1624	3874	563	1166	841	1742	1098	2275
2	155	290	280	361	403	636	374	802	676	1612	1000	2385	286	593	465	1005	878	1819
3	70	90	230	297	321	414	163	403	298	711	704	1679	103	213	258	535	870	767
4	48	62	195	252	260	338	119	284	156	372	405	968	46	95	169	350	289	599
5	53	68	185	174	193	249	53	126	125	299	234	588	47	96	132	274	229	475
6	26	34	94	121	176	226	31	74	97	231	161	884	36	75	100	207	145	301
7	28	35	87	112	183	236	8	19	102	243	137	337	34	71	65	135	123	265
8	65	84	112	145	182	235	7	17	95	226	112	267	81	64	51	106	110	238
9	95	123	86	111	168	217			75	179	98	298	18	37	45	93	113	235
10	71	92	87	112	153	197			57	136	80	191	23	48	34	70	100	207
11	31	40	65	84	134	173					66	156	2	4	42	87	94	193
12	30	39	48	62	106	137					43	103	4	8	48	99	75	156
13	26	34	38	49	91	118									39	81	68	141
14	14	18	47	61	101	130									33	68	48	99
15	32	41	41	53	71	91												
16	25	32	45	58	83	107												
17	38	49	40	51	48	62												
	1205	1555	2217	2860	3527	4552	1569	3742	3165	7548	4661	11,117	1286	2540	2842	4852	3745	7759

official. But if the standard be reduced to the 80 per cent. uniformity, or 2993 grains instead of 3222 to the pint, the column would yield nearly $2\frac{1}{2}$ pints of that strength.

In the case of senna, the Pharmacopœia, as estimated, may get 78 per cent. or 1972 grains of the extract in its prescribed pint of fluid extract. The last senna column of the table would yield about $2\frac{1}{2}$ pints of this strength. But if the standard be increased to 80 per cent., or 2032 grains of extract to the pint, the column would yield just two pints of this strength.

Of course the weaker percolates of these final columns of this table yield proportionately more when applied to other fresh portions of powder; but in some instances at least, if not in all, repercolation cannot be carried on indefinitely, because of the weak percolate becoming overloaded with extract—the 20 per cent. which is rejected and goes on accumulating—which is assumed here to be medicinally feeble. After a year or two of active practice, it becomes necessary to recover the alcohol from the weaker of the weak percolates, only carrying on the stronger ones. In no case need each separate portion of the residuary weak percolate be kept separate from one making to the next, but the different strengths may be grouped together so as to preserve the whole in three or four bottles for each substance.

From the above considerations it would follow that a fluid extract representing a drug minim for grain, might be defined or described as a solution containing 80 per cent. of the extract of that drug, which is soluble in a given prescribed menstruum. And fluid extract of senna, for example, would be powdered senna repercolated with diluted alcohol until equal volumes of the menstruum and percolate weighed at the same temperature, differ to the extent of 14.5 per cent. = 988 grains to the pint.

The menstrua for fluid extracts need much revision and much research, for upon the menstruum a large part of the therapeutical as well as pharmaceutical success depends. The writer has only very imperfectly studied this branch of the subject, and yet too much time and space would be required to give an abstract of the observations made. He must therefore be content with offering his judgment as based on his experience.

The author here makes some remarks on the strength of commercial spirit, and the custom of the spirit trade in America, which we pass over. It may be as well to state, however, that the United States Pharmacopœia includes three kinds of spirit, namely—

Alcohol	Sp. gr. 0·835.
Alcohol dilutum. Alcohol mixed with equal volume of water	Sp. gr. 0·941.
Alcohol fortius	Sp. gr. 0·817.

alcoholic menstruum which the writer has found necessary
ar, is a mixture of equal parts, by weight, of stronger alcohol
ater. This mixture rejects much more of the troublesome
ginous portions of such drugs as dandelion than the diluted
l does.

al weights of alcohol, specific gravity ·81953 at 15·6° C.=60°
l water, give a mixture having a specific gravity

at 15·6° C.=60° F.	·92858.
at 25° =77° F.	·92003. Difference, ·00089 for each 1° C.

pint of this mixture

at 10·6° C.=51° F.	weighs 439·93 grm.=6789 grains.
at 30·6° C.=87° F.	„ 433·03 „ =6682 „
20° C.=36° F.	6·9 „ = 107 „

mixture of three parts, by weight, of stronger alcohol, and one
glycerine, proves to be a very good menstruum for cinchona
barb, and may be found applicable to other drugs.

Made with alcohol of sp. gr. . . .	·81674 at 15·6° C.
and glycerine „ . . .	1·2523 at 15·6° C.

mixture has a specific gravity

at 15·6° C. = 60° F.	·90050.
at 25° C. = 77° F.	·89296, or ·000802 for ea. 1° C.

pint of this mixture

at 10·6° C.=51° F.	weighs 427·30 gram.=6594 grains.
at 30·6° C.=87° F.	„ 419·82 „ =6479 „
20° C.=36° F.	7·48 „ = 115 „

other special menstruum thus far studied by the writer
that has been found well adapted to wild cherry bark,
brava, and uva ursi. This is a mixture of two parts stronger
l, three parts glycerine, and five parts water. By measure
very nearly two measures each of the alcohol and glycerine,
ar of water.

le from alcohol of sp. gr. ·81953 at 15·6° C., and glycerine
1·2523 at 15·6° C., it has a sp. gr.

at 15° C. = 60° F. 1·03833,
 at 25° C. = 77° F. 1·03283, or nearly ·0006 for ea. 1° C.

One pint of this mixture

at 10·6° C. = 51° F.	weighs 492·03 gram.	= 7593 grains.
at 30·6° C. = 87° F.	„ 486·97 „	= 7514 „
20° C. = 36° F.	5·06 „	= 79 „

It appears very probable that special menstrua for special drugs can and should be very much multiplied. Indeed, it may be regarded as almost certain that a proper degree of research would show that every drug requires a special menstruum in order to secure the best results. If there be a rule of any general applicability, it is that for drugs which contain definite alkaloids, the menstruum should be as strongly alcoholic as possible, a rule which is in opposition to former practice.

It remains now to notice the prominent fluid extracts with which the writer has had most experience in detail.

Fluid extract of Aconite root.—Not official, but should be, and should always bear a red label. The root should be in very fine powder, and the menstruum stronger alcohol. The official quantity of powder requires 5 f3 for moistening, and the moistened powder should be passed through a sieve before packing. A pint of the menstruum at 25° C. = 77° F., weighs about 5907 grains, and a pint of the finished preparation, at the same temperature, should weigh about 6350 grains, giving a difference of about 440 grains, varying somewhat with the quality of the root and the dryness of the powder.

Fluid extract of Belladonna root.—Not official, but should be, as stronger and more uniform than that yielded by the leaf. The two are not necessary, and if the leaf was dropped, the root would soon go into general use. The fluid extract should always bear a red label.

The root should be in very fine powder, and the menstruum stronger alcohol.

Fluid extract of Buchu, official.—The leaf should be green and fresh, the short buchu the best, and be in very fine powder. Many menstrua tried, with various portions of glycerine and water, but none so good as stronger alcohol. About 8 f3 required to moisten the powder, which should be passed through a sieve before packing. A pint of the menstruum weighs about 5907 grains, and a pint of the finished preparation about 6677 grains, giving a difference of about 770 grains.

Fluid extract of Cimicifuga, official.—The root being in very fine order, the official plan yields an excellent preparation by repercolation. The process could, however, be much simplified.

Fluid extract of Cinchona, official.—The bark should be in very fine powder, the menstruum one part glycerine and three parts alcohol, and 8 f3 should be used to moisten the powder before percolating. Many menstrua were tried with this drug, but none seemed to answer so well as the mixture indicated. With it a fluid extract was prepared of which a minim represented about one half grain, and this has now stood more than four months without a deposit. Therefore, a preparation of one minim to the ounce, or double the present official strength, would probably stand indefinitely, and this change of strength is, in the writer's judgment, very desirable. The details of this percolation are given in the official process. In the management of this drug the weak percolates become overloaded with extract from time to time, but the alcohol can be easily recovered from them without much damage, as the cerine takes care of the alkaloids and bitter principles.

The writer has found no demand for fluid extract of colchicum, and believes it to be a useless preparation, while that of the digitalis is so commonly used, and a more uniform preparation.

Fluid extract of Conium seed, not official.—But should be. One hundred pounds of green unripe fruit or seed, yield about thirty-five pounds of dried unripe fruit, which when properly dried retains its green colour. The best fluid extract of this very tender and sensitive drug, is made by crushing the fresh unripe seed with a small portion of stronger alcohol slightly acidulated with hydrochloric acid, and pressing out the liquid by a powerful press, and evaporating without heat, by enclosing it over lime, until three pounds of the dried unripe fruit is represented by one pint of the preparation. An excellent preparation may also be made from the dried unripe fruit in fine powder, by repercolation with stronger alcohol slightly acidulated with hydrochloric acid.

Fluid extract of Ergot, official.—Ergot cannot be obtained in fine order without material injury. It should be had in as fine an order as practicable without drying, and this grinding should be done at the time when it is to be percolated. Skillfully repercolated with diluted alcohol acidulated with one per cent. of acetic acid, the preparation appears unexceptionable. A pint of the menstruum, at 25° C. = 77° F., weighs about 6824 grains, and a pint of the finished preparation weighs about 7224 grains, giving a difference of about 400 grains.

Fluid extract of Ipecacuanha, official.—This preparation is very much in need of special study and research, the present formulae being troublesome and uncertain in regard to the precipitation of the resin, and yielding a preparation not uniform in appearance and properties.

Fluid extract of Pareira Brava, not official.—But should be. This drug from its density is a refractory substance to percolate. It should be in the finest possible powder, and be percolated very slowly with the mixture of alcohol, glycerine, and water.

Fluid extract of Wild Cherry Bark, official.—This is, perhaps, the most troublesome of the official formulas, and requires more knowledge and skill than repercolation does. If the menstruum be watery enough, and contain but little alcohol, the reaction between the constituents of the bark for the production of hydrocyanic acid and oil of bitter almonds takes place during the maceration, and thus saves the circuitous route by emulsion of almonds. The mixture of alcohol, glycerine, and water is well adapted to this percolation, and yields a preparation having much more of the sensible properties of the drug than the official process. It should also be made double the present official strength.

A pint of the menstruum weighs about 7540 grains at mean temperatures, and a pint of the preparation of full strength about 8290 grains, giving a difference of about 750 grains. Or, for the present official half strength the weight of a pint would be about 7915 grains, with a difference of about 375 grains.

The hydrocyanic acid and oil of bitter almonds of this preparation seem to suffer spontaneous decomposition, as the proportion, always very small, appears to diminish somewhat rapidly. As the physician often needs these sedative constituents, they should be added at the time of prescribing.

Fluid extract of Rhubarb, official.—The rhubarb should be in very fine powder, and be repercolated with the mixture of one part glycerine and three parts stronger alcohol. Many menstrua were tried with this drug, but none seemed to do as well as that indicated. A pint of the menstruum weighs about 6828 grains, and a pint of the finished preparation about 7328 grains, giving a difference of about 500 grains.

Fluid extract of Sarsaparilla, and compound fluid extract of Sarsaparilla, both official.—Should be in fine powder, and be repercolated with diluted alcohol, and glycerine added to the weak residuary percolate in such amount as to constitute one-fourth the weight

the finished preparation. This should then be reduced to the per extent by distillation, and the glycerine residue be added to the strong percolate.

The measure of the compound fluid extract is often complained of and probably might be omitted without injury.

Fluid extract of Senna, official.—This preparation, made by the official process, is often complained of for want of purgative strength. In order to try the effect of stronger alcohol as a menstruum for senna, a portion was completely exhausted by the use of 70 per cent of the alcohol. The residue was dried, and when taken by the writer in doses of 180 to 200 grains, proved purgative, and without griping. Other portions were exhausted by weaker alcohol, and the residue tried in the same way, but the purgative effect did not disappear entirely until the alcohol was reduced to the addition of half its volume of water. It appears, therefore, that the official diluted alcohol, as now used, or that which is little stronger, as made by mixing equal weights of stronger alcohol and water, are one or the other proper for the re-percolation of senna. The diluted alcohol has been tried and does well, but whether the other would be better has not been tried. The addition of glycerine, even in small proportion, overloads the preparation with mucilaginous extractive matter.

Fluid extract of Dandelion, official.—The German bitter root is much preferred by the writer, and it should be in very fine powder. The official diluted alcohol, as now directed, dissolves an unnecessary proportion of the mucilaginous ingredients of the drug, and clogs the percolations. A mixture of equal weights of stronger alcohol and water answers better, and yields a good preparation.

Fluid extract of Uva Ursi, official.—Should be simply re-percolated with very fine powder by the mixture of alcohol, glycerine, and water. The menstruum seems well adapted to this drug.

Fluid extract of Valerian, official.—Various mixtures of glycerine were tried for percolating this drug, but without success, nothing operating so well as stronger alcohol. English valerian yields a preparation of milder taste, and finer and more delicate odour. The German or French drug, which gives a peppery impression on the tongue, is doubtless the more effective medicinal agent.

Fluid extract of American Hellebore, official.—This should be re-percolated in very fine powder with stronger alcohol, and should always bear a red label.

Fluid extract of Ginger, official.—This should be made from African ginger in very fine powder, and not from Jamaica ginger. The latter has a fine aromatic flavour, but the former is the stronger carminative. The menstruum should be stronger alcohol.

The difficulty and labour in making good fluid extracts has recently led to a proposition, chiefly advocated among the pharmacists of Chicago, to reduce the strength of these preparations to one-half, or to the present strength of the fluid extracts of cinchona and wild cherry bark. Although there are some good reasons for this proposition, yet in the writer's opinion it would not be a wise change. The popularity of these medicines, as a class, depends largely upon the convenience which they offer to country physicians of carrying their remedies in a small compass, and in a convenient form; and to give this and many other advantages up at this late day, after many of the difficulties and deficiencies have been discovered and remedied, would be to sacrifice much useful labour with the recognised advantages. Besides, one of the most useful of the directions in which progress in pharmacy is recognised, is in the concentration and condensation of medicinal agents.

One direction in which several of the fluid extracts might be improved, is by the addition of corrigents. Fluid extracts of cinchona and senna should have aromatics in full proportion added, and there should be a fluid extract of May-apple with belladonna or hyoscyamus, and aromatics.

Extractum Cinchonæ Flavæ Liquidum. A. W. Gerard. (*Pharm. Journ.*, 3rd series, i., 863.) The author, who is the dispenser at Guy's Hospital, writes as follows regarding this preparation:—

Having some time since obtained this preparation from a different wholesale house than whence we usually purchased it, I was much surprised at the difference in taste, odour, and colour from that we had been previously using. I was still further astonished when, on dispensing it with an alkali, it gave neither precipitate nor turbidity. I at once set some of this aside for examination, and at the first opportunity prepared some by the British Pharmacopœia; and, having purchased three other samples, I engaged myself to determine their relative value.

We know that its medicinal properties are due to the alkaloids therein; and if it is made as instructed, with the yellow bark, which should contain not less than two per cent. of quinine, a measured quantity should yield, on precipitation with an alkali, an amount of

alkaloids not below a certain standard; what that standard is should, I think, be determined and introduced as a test in a future edition of the Pharmacopœia.

The following table shows the amount of washed and dried precipitate obtained from two drachms of each on the addition of solution of potash:—

No.		Weight of Precipitate.	Colour.	Taste.
1	Home made.	grs. 10	Dark brown.	Aromatic bitter.
2	Purchased.	" 10	" "	" "
3	"	" 7	Brown.	Less bitter.
4	"	" 3	Pale brown.	Slightly bitter.
5	"	" 0	Very pale brown.	Sweetish and faintly bitter.

I subjected each of them to the test for quinine by the ether, chlorine, water, and ammonia process: 1, 2, 3, and 4 gave the emerald green colour, 5 failed; 1 and 2 left the largest amount of quinine upon the watchglass after the evaporation of the ether. I may here mention that a quick and ready method of proving the presence of quinine in this preparation is to place a thin layer on a piece of window-glass: on drying and exposing to the transmitted light, it will show the well-known fluorescence.

It is evident that this article, as met with in our pharmacies, is a very varying product. All of the samples except No. 1 came through respectable wholesale houses; that they should supply chemists with such diluted forms as 4 and 5 is deserving of censure, and warns us to be vigilant.

Glycerole of Lupulin. By Emmet Kannal. (*American Journ. of Pharm.*, xliii., 246.)

℞ Lupulin 1 troy ounce.
 Alcohol 6 fluid ounces.
 Glycerine 9 fluid ounces.
 Curaçao Cordial 1 fluid ounce.

Mix the alcohol with two fluid ounces of glycerine, moisten the lupulin with the mixture, pack into a cylindrical percolator, and continue to add this mixture until eight fluid ounces of the percolate has passed; to this add the remainder of the glycerine, previously mixed with the curaçao, and thoroughly mix the whole together. This will afford, by careful manipulation, a very fine preparation,

miscible with any of the officinal syrups or tinctures, and possessing all the medicinal properties of lupulin. Dose, for an adult, on a teaspoonful, representing $7\frac{1}{2}$ grains of lupulin.

Glycerine, a Vehicle for the Internal Administration of Chloroform. (*Chicago Pharmacist*, iii., 207.) To supply the wants of many physicians of a good vehicle for the internal administration of chloroform, Dr. G. Wilson Murdock, of Cold Spring, New York, in a letter to the *Medical Record*, suggests the use of a solution of chloroform in glycerine, which, having tried, he has found to answer the purpose so completely as to leave little to desired.

Dr. Murdock says that by a little care in rubbing it up, one part of chloroform in bulk can be dissolved in three of glycerine. The solution is perfectly clear, is bland to the taste, and has but a slight odour of chloroform. It can be taken readily as it is, or can be diluted with water to any extent without disturbing the solution. Curiously enough, the addition of water immediately increases the smell of chloroform without any precipitation of it.

In preparing it, it is best to take one part of chloroform with two parts of glycerine; add the chloroform very slowly and rub it up carefully. Then put it in a bottle and let it stand twenty-four hours. A little chloroform will have deposited at the bottom. Separate this and rub it up with the third part of glycerine, then mix it with the rest, and the solution is complete. No further separation will take place. Six ounces of glycerine, with two of chloroform, will give seven fluid ounces of the solution, so that each fluid drachm contains about 17 m of chloroform.

The Infusions of the Pharmacopœia. J. B. Barnes. (*Pharm. Journ.*, 3rd series, i., 368.) In this paper the author describes the results of a careful set of experiments made with a view of ascertaining the effect of shortening the time of maceration ordered in the Pharmacopœia for the infusions. In each separate set of operations the sample of drug employed was the same; the measuring and weighing were carefully made; each infusion, excepting that of linseed, was filtered through paper before the specific gravity was taken and the evaporation set going; the latter was made in porcelain dishes over a water-bath, and the resulting extract finally dried in a water-oven at 212° F. until the weight became constant.

In the following table the results obtained are exhibited:—

PREPARED IN ACCORDANCE WITH TIME ORDERED.			
Infusion.	Time of Infusion.	Specific Gravity.	Weight of Dried Extract obtained from 10 fl. oz. of Product.
			In Grains.
Bearberry .	Two hours . .	1·215	82·25
Buchu . .	One hour. . .	1·213	55·08
Cascarilla .	One hour. . .	1·211	42·28
Cinchona .	Two hours . .	1·210	29·93
Cusparia .	Two hours . .	1·210	46·45
Digitalis .	One hour. . .	1·208	8·25
Dulcamara.	One hour. . .	1·215	79·16
Gentian . .	One hour. . .	1·215	34·87
Hop . . .	Two hours . .	1·213	43·04
Linseed .	Four hours . .	1·210	19·75
Rhatany .	One hour. . .	1·210	33·33
Rhubarb .	One hour. . .	1·211	41·82
Senega . .	One hour. . .	1·213	56·93
Senna . . .	One hour. . .	1·223	140·12
Serpentaria	Two hours . .	1·209	10·95
Valerian .	One hour. . .	1·210	29·47

NOT PREPARED IN ACCORDANCE WITH TIME ORDERED.			
Infusion.	Time of Infusion.	Specific Gravity.	Weight of Dried Extract obtained.
			In Grains.
Bearberry .	One hour . . .	1·215	82·56
Buchu . .	Half an hour .	1·213	54·78
Cascarilla .	Half an hour .	1·211	42·12
Cinchona .	Half an hour .	1·210	30·24
Cusparia .	One hour . . .	1·210	47·22
Digitalis .	Fifteen minutes	1·208	8·25
Dulcamara.	Half an hour .	1·215	79·32
Gentian. .	Half an hour .	1·208	33·33
Hop . . .	One hour . . .	1·213	42·9
Linseed. .	Two hours . .	1·210	19·59
Rhatany .	Half an hour .	1·210	33·17
Rhubarb .	„ . . .	1·211	41·81
Senega . .	„ . . .	1·213	55·55
Senna . . .	„ . . .	1·221	137·34
Serpentaria	„ . . .	1·209	10·08
Valerian .	„ . . .	1·210	28·7

Infusion of bearberry made in two hours gave 5·33 grammes
tract; that which had infused one hour yielded 5·35 grammes;

the infusion which had stood for half an hour gave 2·82 grammes the conclusion is, that the one-hour infusion is as good as that which stood two hours.

Infusion of buchu, made to infuse half an hour, gave 3·55 grammes of extract, and that which stood one hour 3·57 grammes; there is no real difference.

Cascarilla infusion, made in one hour, gave 2·74 grammes of extract, and that which had stood half an hour 2·73 grammes.

Infusion of cinchona bark, prepared in one hour, yielded within two centigrammes the same amount of extract as that which had been infused for two hours; practically they are identical.

Infusion of cusparia (although the temperature of the distilled water is ordered to be at 120° F., and the time of infusion two hours) is equally strong when macerated for one hour only.

Infusion of digitalis made in fifteen minutes gave exactly the same amount of extract as that which had stood one hour.

That of dulcamara, infused for half an hour, yielded within one centigramme the same weight of extract as that which had infused one hour.

Compound infusion of gentian, made in accordance with the time and manner ordered in the Pharmacopœia, namely, one hour, and the root sliced, gave 2·26 grammes of extract; whilst when infused for half an hour, and the gentian root was bruised, the amount of extract obtained was 2·85 grammes; therefore there can be no doubt that it should be directed to be bruised instead of sliced. Of course, when gentian root is fresh, it is tolerably soft, and can be easily sliced as thin as you please, but it is seldom met with in that state.

Infusion of linseed, which had stood for two hours, was within one centigramme as strong as the Pharmacopœia infusion, which is directed to be infused for four hours.

Infusion of hop, made in one hour, was also within one centigramme as strong as that which had stood two hours.

Infusion of rhatany, made in half an hour, yielded 2·15 grammes, whilst that which had infused one hour gave 2·16 grammes of extract.

Senega infused for half an hour gave 3·6 grammes of extract, and that of the Pharmacopœia, which stood one hour, 3·69 grammes.

Infusion of senna, made in accordance with the time in the Pharmacopœia, yielded the large amount of 9·08 grammes, that prepared in half an hour gave 8·9 grammes of extract; therefore, this is not so good as that which had stood one hour, but by a slight

in the quantity of senna, this infusion can be made in half as long as the Pharmacopœia preparation.

Infusion of serpentaria, which had stood for two hours, yielded 1.86 gramme of extract, whilst that made in half an hour, gave .79 gramme.

Infusion of valerian, made in one hour, gave 1.91 gramme of extract, whilst an infusion prepared in half an hour yielded 1.86 gramme.

From these results, the author draws the following conclusion :—That infusions of bearberry, buchu, cascarilla, cinchona, dulcamara, gentian, hop, linseed, rhatany, rhubarb, senega, valerian, can be prepared in half the time ordered by the Pharmacopœia; those of digitalis and serpentaria in one-fourth the time directed for infusion; and this without resorting to any special mode of making.

On the publication of this paper, Mr. A. Allchin, in an article in the *Pharmaceutical Journal* (Nov. 26, Dec. 17, pp. 421, 481), referring to this subject, gives a careful résumé of all that has been said upon the preparation and preservation of infusions, and states the conclusions at which Mr. Barnes had arrived. He writes as follows :—Let all roots, barks, and leaves be reduced to coarse comminution, that will allow them to pass through a sieve of eight meshes to the linear inch; be careful always to have the infusion-jug hot, and make the infusions in quantities of not less than one pint; then examine the results, and it would not surprise me should be found that the time for standing can, in some cases, be reduced to a few minutes, and that not more than one or two exceed half an hour.

Liquor Epispasticus and Vesicating Collodion. C. R. C. Tichenor. (*Pharm. Journ.*, 3rd series, i., 501.) The author states, that the present formula for liquor epispasticus, there is evidently a defect. Based upon a valuable idea, it is obvious that the wrong has been specified. The following is the formula :—

R. Cantharides, in powder	8 ounces.
Acetic acid	4 fluid ounces.
Ether	a sufficiency.

For the cantharides and acetic acid, pack them in a percolator, and at the expiration of twenty-four hours, pour ether over the contents of the percolator, and allow it to pass slowly through till five fluid ounces are obtained."

The acid directed in the above formula is the ordinary acetic acid, of a specific gravity of 1.044. Now, independently of the

want of solubility of canthardine in cold acid of that gravity (see remarks on Solubility of Cantharidine, p. 318), two parts of acetic acid are not miscible with fourteen parts of ether of the gravity required by the Pharmacopœia.

(These are the proportions that would be used.)

If we mix them in the above proportions we get a product presenting two layers; the lower one consists almost entirely of water, and is about one-half the bulk of the original acid employed: while the upper is ether, holding in solution about $\frac{1}{15}$ of a stronger acid than that originally used; however, these fluids act rather *diffusely* when employed for the exhaustion of the cantharides. Obeying strictly the Pharmacopœia, we find that on passing the ether through the powdered flies, the ether extracts the green oil and other ingredients of the cantharides, the latter retaining the greater part of the water present in the acetic acid. The result is an ethereal tincture saturated with water, and having a specific gravity of about .770 at 15° C. About 14 ounces of ether are consumed to produce the half-pint of liniment. If the residue is squeezed, a considerable quantity of water is the result, and on drying in the air until the whole of the ether has evaporated, the flies will be found to weigh nearly one quarter more from the water absorbed, instead of being lighter from the loss of extractive. A process of separation seems instituted, by which the aqueous portion is retained by virtue of the attraction of the animal matter.

It is evident that glacial acetic acid should be used; if this is done, a rapidly vesicating and homogeneous fluid is obtained. The following is the alteration that the author suggests:—

B.	Cantharides in powder	8 ounces.
	Glacial Acetic Acid	2 fluid ounces.
	Ether.	28 ounces, or a sufficiency.

Rub the cantharides in a mortar with the glacial acetic acid, and proceed as directed in the Pharmacopœia. The consumption of ether will be found to be about the same as in the previously mentioned formula, namely 28 ounces, the specific gravity at 15° C. being .779; in this instance the cantharides will be found to have lost considerably in weight, for on exposure to the air for a short time until the ether had evaporated, they were found to weigh only 7 ounces.

A formula for vesicating collodion might at the same time be introduced, that preparation being more extensively used than the

var or liniment. The collodion is a great favourite with the almic surgeons ; it is easily made in the following manner :—

℞ Blistering liquid 10 fluid ounces.
(not made with ordinary acetic acid.)
Gun cotton $\frac{1}{4}$ ounce, or a sufficiency.

and shake them occasionally until dissolved, and add more cotton if not thick enough. This, in fact, resolves itself into formula published by the author in 1862.*

Preparation of Guaiac Resin for Medicinal Use.† James T. Shinn. (*Amer. Pharm. Assoc.*, 1870, 78, 148.) There are two official preparations of guaiac,—the tincture and ammoniated tincture, of which are perfect solutions of the drug, but are very disagreeable in taste when given alone, or even when diluted with 4 or 5 parts of water. The great desideratum is to find a menstruum which is a good solvent, readily miscible with water, and palatable; although unsuccessful in this attempt, the author gives some results of the experiments made.

Alcohol dissolves all the resinous portion of commercial guaiac, leaving from 20 to 25 per cent. of impurities, chiefly chips of the wood and sand; and the purified guaiac obtained by evaporating the alcohol from this solution is readily dissolved by its weight of ether fluid. The official tincture (3 ounces to a pint), will bear an equal volume of water or syrup and remain clear, and is miscible in all proportion with glycerine and liquor potassæ without producing turbidity.

By making a reduction in the amount of spirit might be an advantage, the following formula was tried :—

℞ Purified Guaiac 3ij.
Alcohol f 3iij.
Solution of Potash f 3ij.
Glycerine f 3xj.

Dissolve the guaiac in the alcohol, and add the solution of potash and glycerine.

This forms a clear and permanent solution, of pleasanter taste than the tincture when given alone, but when mixed with water leaving about the same turbidity, and leaving the same acrid

Pharm. Journ., 2nd series, vol. iii., 506.

As reported at the meeting of the American Pharmaceutical Association, in answer to the query, "What is the best and most eligible liquid form for the preparation and administration of guaiac resin?"

taste in the fauces. Glycerine does not mask this acidity so well as sugar; but the substitution of part syrup produced a precipitate of the resin.

Decidedly the most agreeable manner of administering guaiac in liquid form, so far as tried, is that of a syrup prepared as follows:—

R. Guaiac	3j.
Solution of Potash	f 3ss.
Sugar	3iv.
Water sufficient.	

Macerate the guaiac in the solution of potash, mixed with f5ij of water, for 2 or 3 days; then percolate with water till f3viij. of liquid are obtained, in which dissolve the sugar.

This syrup is quite pleasant to the taste, and can be taken alone or mixed with water; it has been prescribed for several years by Dr. Ludlow, of Philadelphia, with decided benefit in cases of rheumatism, and can be given for a long period without exciting disgust.

The quantity of solution of potash may be doubled without rendering the syrup unpalatable, and thus would increase the amount of guaiac dissolved.

Solution of Santonine. John Harley, M.D. (*Practitioner*, 1871, No. 32, p. 85.) Dr. Harley calls attention to the insolubility of santonine, which considerably impairs its utility as a vermifuge. Water cold or warm takes up the merest trace. Chloroform, absolute alcohol, the strongest acetic acid, turpentine, hot olive oil, and hot glycerine, are the only simple fluids that dissolve any appreciable quantity. It separates from the oil and glycerine on cooling; water added to the other solvents produces the same result.

Having investigated the subject, Dr. Harley found, after a good deal of trouble, that a useful solution might be obtained by means of carbonate of soda. The following is the formula:—

R. Santonini, in pulvere	gr. xij.
Sodæ Bicarbonatis	gr. xx.
Aquæ Destillatæ	3iij.

Put the soda and water into a flask, keep the fluid near the boiling-point, and add the santonine about 2 grains at a time until the whole has dissolved. Solution is effected in about half an hour, during which time the water is reduced to 3ij., or if not, may be reduced to that bulk, when 3j. will contain a full dose—6 grains of santonine.

The solution is bright and permanent, strongly alkaline, free from odour and, except that of carbonate of soda, taste. Carefully neutralised with acetic acid, an equally bright and permanent solution is formed. Both may be diluted to any extent with hot or cold water without impairing the solution of the santonine. The whole or nearly the whole of the santonine is precipitated in its original form of colourless rectangular plates, with bevelled edges, immediately by mineral acids, and after some hours by excess of acetic acid.

Mixed with acid urine, sp. gr. 1·0175, containing excess of uric acid, and kept for several hours at 100° F., no turbidity is produced, unless in the case of the alkaline solution and an excess of phosphates in the urine, when a slight cloudiness may occur from the separation of the latter. This proves that excess of uric acid fails to cause a deposition of santonine.

In cases where powders are objected to, a pleasant mixture may be made by adding a little syrup and flavouring water to the solution of santonine.

Ferrated Elixir of Cinchona. (*Amer. Journ. Pharm.*, xliii., 219.) The editor of the *American Journal of Pharmacy* publishes the two following formulas for this preparation.

They represent the two views held by American pharmacutists regarding this combination. According to one of these, cinchona bark, as such, should be employed, while according to the other, the isolated alkaloids alone should be combined with salts of iron.

The first formula is furnished by Mr. William McIntyre for an elixir of calisaya bark with pyrophosphate of iron.

R. Calisaya Bark	4 ounces.
Sweet Orange Peel, recently dried	3 ounces.
Coriander	6 drachms.
Ceylon Cinnamon	4 drachms.
Cardamoms	2 drachms.
Anise	2 drachms.

Prepare these for percolation, and displace with a mixture of 1 quart of stronger alcohol and 3 quarts of water. To this tincture add,—

Oil of Orange (fresh)	40 m.
Oil of Lemon (fresh)	16 m.
Oil of Almonds (essential)	4 m.

dissolved in 4 fluid drachms of alcohol.

Agitate this mixture with moist, freshly precipitated hydrated

sesquioxide of iron (well washed), prepared from an aqueous solution of the sesquichloride, for 3 or 4 days, or until a portion filtered off shows no reaction with the tincture of chloride of iron. Filter, and dissolve in it, without heat, $2\frac{1}{2}$ pounds of sugar. Add 1024 grains pyrophosphate of iron, previously dissolved in a small quantity of water, and make up the measure to 1 gallon if necessary, by the addition of water. If a more reddish colour is wanted, use a few grains of soluble citrate of iron.

The elixir thus prepared will keep well in colour, and has a resemblance to the article extensively advertised under the same name.

If the cinchona bark contains 3 per cent. of alkaloids, and supposing the bark to be entirely exhausted, 1 gallon of elixir prepared accordingly to the above formula would contain about 60 grains of alkaloids, or nearly half a grain to the fluid ounce. Cinchona bark, however, cannot be completely exhausted by weak alcohol; and after the treatment of the resulting tincture with hydrated sesquioxide of iron, the natural combination of the cinchona alkaloids is broken up, and nothing of medicinal value is retained by the liquid except the alkaloids. These considerations have led Mr. J. M. Maisch to adopt the following formula which he has used for several years with satisfaction:—

1. Triturate half an ounce of carbonate of magnesia with the following oils:—

Ol. Aurantii	20 m.
Ol. Anisi	15 m.
Ol. Coriandri	10m.
Ol. Cinnam.	10 m.
Ol. Carui	5 m.

Then, with a mixture of 2 ounces of alcohol and 14 ounces of water, throw upon a filter, and wash with water until the filtrate measures $3\frac{1}{2}$ pints.

2. ℞ Tinct. Cardam. Simp.	2 ounces.
Tinct. Zingib.	1 ounce.
Tinct. Calami	1 ounce.
Alcohol	1 pint.

Mix, and add simple syrup 1 pint.

3. Dissolve unbleached quinia $1\frac{1}{2}$ drachms, with $2\frac{1}{2}$ drachms of citric acid, in 4 fluid ounces of dilute alcohol.

4. Dissolve 20 drachms of pyrophosphate of iron in 8 ounces of hot water.

duction No. 3 to No. 2; then add No. 4, then No. 1. And add $1\frac{1}{2}$ pints of simple syrup and $\frac{1}{2}$ pint of alcohol. The measures $8\frac{1}{2}$ pints, and may be coloured by caramel; each measure contains about $9\frac{1}{2}$ grains pyrophosphate, $\frac{2}{3}$ grain of and 1 grain of ginger, of calamus, and of cardamom. It is very pleasant, warm, aromatic, but at the same time a bitter, taste.

III. C. L. Diehl. (*Pharmacist*, iv., 25.) Blue pill is one of the simple preparations of our Pharmacopoeia that is seldom prepared by the apothecary; in fact, its preparation is the exception and its use appears to be the rule. There are numerous reasons why it is not generally prepared by dispensers, first and foremost of which may be mentioned the labour attending the extinguisht mercury. Quite a number of processes for facilitating this have from time to time been recommended, but none seemed so simple as that commended some time ago by a writer in one of our pharmaceutical journals, which consists in agitating the mercury with a small portion of tincture of tolu, and then incorporating it with the other ingredients. Another reason appears to be that blue-pill has been made strictly according to the Pharmacopoeia, soon becomes hard and unmanageable. Manufacturers, taking advantage of this, aim to produce a blue-mass which, while corresponding in strength to the official article, will retain its plasticity; and thus they create a demand for their particular preparation.

Engaged in the manufacture of blue-mass on a considerable scale, the author found it necessary to change the ingredients in order to obtain a more plastic mass, and succeeded very well, with the exception, namely that the mass was liable to become somewhat hard, and consequently more or less difficult to roll out. In respect to the mass left nothing to be desired. By experiments made, the author believes he has overcome this difficulty, but is as yet that experiments with tincture of tolu warrant the belief that it affords a rapid and convenient medium for extinguisht mercury, without the application of more manual labour than is usually bestowed upon the object.

One ounce of mercury is briskly agitated with half a fluid ounce of tincture of tolu, contained in a two-ounce vial, it soon divides into globules, and in perhaps one or two minutes the globules will be scarcely visible, as such, to the naked eye. A small brisk agitation for twenty to thirty minutes, however, is sufficient to so far extinguish the mercury as to render globules

invisible through a lens of moderate power. After the mercury so far extinguished, it would appear an easy matter to mix it with syrup, honey, or any other desirable fluid that, in the manufacture of blue-mass on a large scale, is employed as an extinguishing medium; but this is found not to be the case, for when the mixture is stirred into the remaining ingredients for blue-mass, globules of mercury abundantly form, and delay the completion of the process considerably. This is probably owing to the action of the syrup or honey, etc., upon the tolu coatings of the minutely-divided mercury, by which a portion of mercurial surface becomes exposed, and unites with another in a similar condition.

However, something is gained by the use of tincture of tolu, for blue-mass may be prepared in less than an hour, twenty to thirty minutes of which are consumed in briskly rubbing the mixture to entirely remove globular mercury.

If it were practicable to keep blue-mass in the form of the regrain pills, as provided by the formula of our Pharmacopœia, there would be no necessity for a change in its ingredients. This not being the case, the formula should be so altered as to ensure a mass that will keep its soft consistence for a reasonable period. It may be contended that the ingredients entering its composition are necessary to its remedial properties, for some authorities maintain that blue-mass owes its virtue to the metal in an oxidized condition, and the question may then arise, "*Do the ingredients of the official blue-mass specifically tend to promote this oxidation?*" It is reasonable to suppose that such is not the case, for otherwise much of the blue-mass of commerce, in every other respect properly prepared, would be found ineffective. The author ventures to doubt that either powdered liquorice root or the components of confection of rose are essential to the effectiveness of blue-mass, and proposes for its preparation the following formula:—

℞	Mercury, finely powdered	Marshmallow Root	each	1 troy oz.
	Syrup, Glycerine		each	240 grs.
	Tincture of Tolu			30 mins.

Introduce the mercury into a two-ounce vial containing the tincture of tolu, and agitate briskly, at short intervals, for thirty minutes, or until the mercury shall have become entirely extinguished; then weigh the syrup and glycerine into a vial, agitate briskly, and immediately incorporate with the powdered marshmallow, rubbing the mass until any globules of mercury formed have entirely disappeared.

the mass is formed in this manner with less labour, in a shorter time, and of a better consistence, than by any other process. While the mass is decidedly firm, it will remain plastic for some time, and can be rolled into pills that will keep their shape perfectly. After the addition of the liquid mixture to the powdered arrowroot, the mass retains a very soft consistence for a considerable time, requiring less laborious mixing than when confectionery is used.

Quinia Pills. C. L. Diehl. (*Pharmacist*, iv., 25.) *Quinia pills* dispensed by the author preferably, by forming the mass with aid of glycerine, and rolling the pills in sifted arrowroot. A beautiful white pill is formed, which, by fastidious persons, is preferred to pills rolled in liquorice powder or lycopodium. Some persons object to the use of *glycerine*, on account of technical difficulties, but the author has always found it the most convenient ingredient for general pill-making, having seldom to resort to any other. Then its tendency to prevent the pills from becoming hard fully compensates any additional labour that may now and then attend its use.

Several of our physicians prescribe sulph. quinia with tartaric acid, according to a formula published some years ago. Quinia pills formed may possess some advantage over the simple quinine pills, being probably more readily dissolved and assimilated. The following is the formula:—

R. Sulphate of Quinia	30 grs.
Tartaric Acid	4 grs.
Water	1 drop.

Mix, and make pills of the required quantity.

The single drop of water is sufficient to form 30 grs. of quinia into a plastic mass, which must, however, be rolled into pills rapidly, as it becomes hard and more water is required.

These pills like the preceding, should preferably be rolled in sifted arrowroot; in fact, all pills composed of colourless substances should be rolled in this powder, as it, apart from other considerations, necessitates the utmost cleanliness.

Pills of Sulphate of Quinine. (*British Medical Journal*, 1871, i., 1.) In order to ensure the solubility of quinine when made into pills, M. Cazac (*Rev. Méd. de Toulouse*) proposes to mix the sulphate with tartaric acid. This had already been recommended, but the quantity of acid proposed was too large. M. Cazac uses one part of tartaric acid to five of sulphate of quinine, making up the pills with conserve of dog-rose.

Pills of Oil of Sandal Wood. A. E. Ebert. (*Chicago Pharmacist*, and *Pharm. Journ.*, 3rd series, i., 566.) The author, having been several times called upon to prepare pills from oil of yellow sandal wood, has adopted the following form with satisfaction to prescriber and patient:—

R Oil of Yellow Sandal Wood . . . half a troy ounce.
Yellow Wax half a troy ounce.

Melt the wax in a capsule and weigh into it the oil of sandal wood; mix and stir until cold, then roll out the mass, and divide it into 80 pills, by means of the pill machine, or pill-tille, in the same manner as an ordinary mass, and sprinkle with marshmallow-root powder. Each pill contains three grains, or about five drops of the oil. The excipient is unobjectionable, as it is readily soluble in the juices of the stomach. In the same manner pills of the oils of cubebs, black pepper, and fleabane have been made.

Carbolic Acid Pills. C. L. Diehl. (*Pharmacist*, iv., 25.) Carbolic acid in pills is occasionally prescribed. The author having never met with any particular formula, suggests the following as convenient and satisfactory:—

R Carbolic Acid 1 part.
Powdered Elm Bark 3 parts.
Gum Arabic 1 part.
Tragacanth Paste a sufficiency.

Mix, and make pills of the required size, which may be coated with tolu or silver leaf.

Coating of Pills. A. E. Ebert. (*Amer. Journ. Pharm.*, xlii., 541.) A prevailing fashion in pharmacy, or rather among prescribers, is the use of sugar-coated pills. This is very detrimental to the practice of legitimate pharmacy, whatever may be its effect upon those who swallow the pills. An extemporaneous process of sugar-coating is a desideratum for which our colleges of pharmacy should unite in offering a prize. In the absence of this, a very excellent substitute may be found in resin. This substance is easily applied, gives a hard, tasteless surface, a handsome appearance, and has a decided tendency to protect the pills from change. The coating cannot interfere with their medicinal action, for it is readily dissolved by the fluids of the stomach. The process of coating is easy and expeditious, and no apparatus is required.

We proceed as follows, keeping prepared a solution of resin in ether, one part of resin to ten parts of the fluid. We return the pills, after they have been rolled to shape, to the mortar in which

air ingredients were mixed, pour over them a little of the resinous
 ution, give the mortar a few twirls, and roll them out upon the
 tform of the pill-machine or pill-tille. By the time the label is
 pared the pills will have become sufficiently dry to allow boxing.
 little dusting powder, preferably lycopodium, should be dusted
 or them, and the work is done.

Improved Dover's Powder. By B. D. Keator, M.D. (*Pharma-*
 ', iv., 140.) A very convenient and useful compound is Dover's
 wder; but, unfortunately, a very *nauseous* one. The author con-
 lers that the opium and sulphate of potash (the main nauseants)
 n be replaced with better ingredients.

In the formula now proposed, there is 1 gr. of ipecacuanha, and
 e-sixth gr. sulph. morphia (equal to 1 gr. opium) to every 10 grs.
 the mixture, The camphor adds much to it as an anodyne, the
 alk is anti-acid, and necessary to hold the camphor in pulverised
 m; and the liquorice, besides disguising the taste of the rest, is
 itself useful as a demulcent, expectorant, etc. The author confi-
 ntly recommends this to his brethren of the profession who choose
 o give it a trial, as *superior to the old Dover's powder in every respect.*

R. Sulph. Morphia	gr. x.
Pulv. Camph.	ʒiij.
„ Ipecacuan.	ʒj.
Cretæ Præparat.	ʒiij.
Pulv. Glycyrrh.	ʒiij.

Thoroughly mix. Dose same as Dover (in water).

The Pulverization of Camphor. R. Rother. (*Pharmacist*, iv.,
 .) The peculiar predilection of camphor for the crystalline form, is
 e of the petty annoyances inherent to the dispensing department.
 significant as the objection may seem, it is nevertheless one for
 rich the dispensing pharmacist is but too willing to accept a
 medy. This difficulty is chiefly experienced with powdered
 mphor, but the objection, likewise, though in a less obvious degree,
 plies to the aqueous solution. The most perfect means of pulver-
 ng camphor, although not the most practicable, is undoubtedly the
 thod by precipitation. The trituration with small quantities of
 loroform, ether, benzine, and naphtha, has been proposed; but none
 these substances possess any advantages over alcohol, which even
 ll is preferable to all. There is no difficulty whatever in pulver-
 ng camphor, the object is to retain it so.

For this purpose it has been suggested to triturate the camphor
 ith small quantities of magnesium carbonate. If this management

ensured the pulverulent state indefinitely, the magnesium would often be objectionable. The writer has not tested the process, but was informed by good authority that it is not satisfactory; a similar result is experienced by precipitating the camphor with water from an alcoholic solution, holding the magnesium carbonate in suspension. Other dry substances, as starch, for instance, have been used with equally indifferent success. The writer, feeling the necessity of some alternative, and basing his theory of this crystallisation upon the volatility of camphor, applied an ethereal solution of resin with a view of coating the particles with a deposit of resin. The experiment, however, yielded a negative result. The writer, assuming then that a non-volatile solvent might retard the crystallization, employed a small proportion of fixed oil—preferably castor oil. This addition is entirely unobjectionable, and although it does not strictly meet the most sanguine expectation of preventing crystallization, it yet modifies this tendency to such a degree that after a long trial the writer is so thoroughly satisfied with its peculiar advantages that the complete success of the experiment would have been scarcely hailed with more delight. The proportion of castor oil employed is about one-part in thirty of camphor, or even less. It is added, together with the alcohol, to the camphor, and the whole triturated to the proper degree of fineness. The great advantage rests in the fact that the crystals of camphor subsequently formed are exceedingly minute, and that the oil entirely removes the very disagreeable adhesiveness and tenacity of the camphor, which becomes so troublesome during the trituration of pure camphor. Camphor containing the oil can be triturated in large or small quantities, without in the least clogging the mortar or pestle. The powder, after keeping even a long time, mixes perfectly and with facility with all the ordinary ingredients with which it is usually combined in prescriptions. The peculiar gumminess has been perfectly removed by the intervention of the oil.

The aqueous solution of camphor is another point at issue. It has been supposed that during cold weather camphor water drops part of its camphor. However, this phenomenon is only apparent. The writer has often been struck by the extraordinary solvent power of very cold water upon camphor, so that during the coldest winter weather the cold water drawn fresh from the hydrant, and having a very low temperature, always yielded the strongest camphor-water, which, when subjected to the warm temperature of the room, deposited camphor abundantly and in weighable quantities, not upon the glass above the liquid, but floating in beautiful crystals in the

liquid itself; so much so, that the water was often filtered again before use.

To verify the above conclusion, the writer employed lukewarm water. The camphor was first finely triturated with the aid of Alcohol, then with the magnesium carbonate, first rubbed through a coarse sieve, then with a portion of the water, and poured into a spacious bottle; the remainder of the water was then gradually added, and the mixture violently shaken during the intervals, and finally filtered. (This is essentially the writer's manipulation for the aromatic waters.) The bottle containing the filtrate was securely corked and allowed to cool. After six hours a very thin film of crystalline camphor had deposited on the walls of the bottle above the liquid, the latter containing no visible trace, not even floating upon the surface. The liquid was again filtered and exposed to intense cold for a long time, but no more camphor separated, although the liquid possessed the taste of camphor in a marked degree. Therefore, to make camphor-water, free from separated camphor, use lukewarm water, or use water of the ordinary temperature, let it become equalised to the temperature of the room, and, after a repose of twenty-four hours, filter. But to make a supersaturated camphor-water, employ water having a very low temperature.

Castor-oil Soap. By F. M. Rimmington. (*Pharm. Journ.*, 3rd series, i., 682.) The author writes:—It is somewhat remarkable that our present English pharmacy has no pure medicinal soap possessing any characteristic property or medicinal activity. The ordinary Castile soap, being that which is commonly used for that ordered by the Pharmacopœia, can scarcely be considered a satisfactory article when we consider its composition and the mode of its manufacture. Having recently had occasion to direct my attention to this subject, it occurred to me that castor oil offered some advantages, and would yield a soap possessing qualities very desirable in an article which so frequently formed the medium or adjunct for administering other active remedies. On putting this idea into practice, I found that a soap prepared from this oil has rather marked qualities, but my opportunities do not afford me the means of properly testing its medicinal properties. I believe it will be found that it has sufficient aperient power to relax the bowels when taken consecutively for several days, but I believe its greatest value will be found as an adjunct to other aperients. This at least is the result I have arrived at. It is, of course, well known that the purgative principle of castor oil has been ascribed by Soubeiran to the existence

of a supposed oleo-resin, and that the ricinoleic acid is extremely acrid. I find when the oil is saponified that this acrid principle is either entirely or partially liberated, and does not continue masked as it is in the oil in its natural state, nor neutralised, as might be expected, by the alkali. It is to this fact, I think, we must look for any active property this soap may possess; and here I must leave the matter for the further investigation of the medical and pharmaceutical professions. The physical properties of the soap are in its favour for use in medicine. It has a clean yellowish-white colour, is free from smell; it soon becomes dry, hard, and is easily powdered; it has no tendency to soften or deliquesce on exposure to the air. In proof spirit it makes a perfectly clear and colourless solution, with only little sediment.

Watts's Chloridised Sanitary Soap. (*Brit. Med. Journ.* 1870, ii., 604.) A sanitary soap is now being manufactured by Messrs. Cowan & Sons, of the Hammersmith Bridge Soap-works, which is made under a patent of Mr. A. Watts, the well-known editor of the *Chemical Dictionary*. The chemical agent combined with it, is the chloride of soda, or bleaching soda, of which it contains nearly two and a half per cent.

Chloride of lime, of which the bleaching, disinfecting, and deodorizing power is well-known, cannot of course, be employed for the purpose, for reasons which will readily occur to the chemist—the palmitate and stearate of lime being insoluble salts. But salts of soda and soap are not incompatible, the palmitate and stearate of soda being soluble salts. The solution of the salt here incorporated with the soap is the well-known Labarraque's disinfecting fluid. In this form it retains its sanitary energies; it adds to the cleansing and bleaching powers of the soap; while the price is not increased beyond that of ordinary soap. Hence for the purposes of hospitals, sick-rooms, and infirmaries, for the laundry, and in domestic use, it will strongly recommend itself. We recommend to our medical officers of health the question of ascertaining its degree of usefulness and reliability in destroying fever-germs.

Iron Soap: Sapo Ferricus Liquidus. (*Pharm. Centralhalle*, 1871, pp. 97-110.) For the preparation of this substance, first prepared by Kral, W. Hildwein has recently given the following process:—Oleic acid is gently heated in the water-bath, and freshly precipitated hydrate of iron oxide gradually added to it, until the oxide is no more dissolved; the undissolved portion is separated by allowing it to settle and then decanting the liquid off. The iron soap thus obtained, is a brownish red syrup which dissolves in water. It is to be noticed

preparation of the hydrate of iron oxide is carefully to be made as to obtain a substance which will completely dissolve in oleic acid. The editor (of the *Pharm. Centr.*) thinks this information not sufficient. It is necessary to state that the oxide must be the trihydrate, for the bihydrate, or even a mixture of tri- and bihydrate, is not soluble in oleic acid. The trihydrate is obtained by precipitating a dilute iron oxide solution with dilute alkali or caustic ammonia at 10° to 17° C. Next, the alkaline iron oxide is, like in the case of the saccharates, a consideration of its solubility. When the iron oxide hydrate is washed out thoroughly, and then mixed with oleic acid or sugar solution, but a trace of it will be found dissolved after long maceration, digesting-boiling, and this trace had been dissolved through the alkalis along with the iron oxide in spite of the most careful washing. The trihydrate is transformed through heating to 100° C., into a mixture of bihydrate and trihydrate is well known, even when anhydrous. This points out the necessity not to go beyond a moderate heat when dissolving the amorphous trihydrate in water, glycerine, or oleic acid. To ensure the dissolving of iron oxide in the oleic acid, it should, after it had been washed thoroughly from the filter, be mixed with a very small quantity of a solution of caustic potash, before it is added to the acid. The same observation applies to the preparation of the iron saccharate. After these preliminary explanations, the following prescriptions for liquid iron soap are given.

Sapo Ferricus Liquidus.

oxydis Ferri Sesquichlorati, pond. sp. 1·470, vel continentis in centenis *oxydis Ferri* partes 15, P. 40. Dilutus: *Aquæ destillate frigidæ* volumine instilla inter agitationem: *Liquoris Ammoni Caustici*, pond. sp. 0·96, et dilutus: *Aqu. Dest. frig.* volumine decuplo.

Quod tempus præcipitatum filtræ ope collige et aqua frig. bene elu. Post uero defluxum præcipitatum madidumingere in patinam porcellan. et commisce cum *Kali Caustici Fusi* P. 1, antea soluta: *Aqu. Dest. frig.* cum *Liquoris Kali Hydrici*, pond. spec. 1·8, P. 3]. Quo facto inter agitationem admisce: *Acidi Oleici* P. 100, tum, aqua a pulvere exorta uero admisce: *Acidi olein.* P. 50.

inam loco tepido per horam seponere, deinde in balneo aquæ colloca, agitando. Post horas duodecim seponere loco tepido, ut partes aquosæ exsiccato non soluto sedimentent. Postremo liquorem oleosum limpido, cum decanthando collige.

Unguentum cum Sapone Ferrico.

oxydis Flavæ P. 1, *Saponis Ferrici Liquidus*, P. 2. Calori balnei aqu. fiant.

Unguentum cum Sapone Ferrico Phenylatum.

℞ Cerae flavae P. 40. Sap. Ferr. Liqu. P. 60. Leni calore colliquis immisce
mixturam paratame: Sap. Ferr. Liqu. P. 20, Acidi Carbolici P. 5.

In the first of these prescriptions, the second addition of oleic acid may be replaced by that of good olive oil.

Kral proceeds in the following manner: 12 pts. of oleic acid, 3 pts. of iron powder, and 1 pt. of water are heated to boiling in an iron casserol, the evaporating water being from time to time replaced. The boiling is continued until the acid has taken up so much iron that the liquid iron oleate on cooling to $+20^{\circ}$ C., possesses the consistency of a thick syrup. Dr. Hager employs no boiling, but a temperature of only 30° to 60° C., in which case, however, a week is required to the finishing of the process. The thick, reddish brown liquid, that had been formed, could easily be filtered through cotton, previously moistened with oleic acid. If there is no hurry for the making of the iron soap, this last method has many advantages. Dr. Hager prepares his oleic acid from almond oil; but he thinks that the acid obtained from colza oil, is just as good for the purpose. The healing value of unguent. c. sap. ferr. phenyl., which may be employed for every kind of wounds, surpasses that of all so-called healing ointments.

Administration of Cod-Liver Oil Saponified by Lime. Dr. Beck. (*Journ. de Pharm. d'Anvers*, 1871, p. 32.) Dr. Van den Corput having observed the excellent results obtained by Professor Namias, with a mixture of cod-liver oil and lime-water, was led to try the effect of a lime soap prepared with cod-liver oil. The administration of this compound has been attended with marked success in the hands of Dr. Van den Corput. M. O. de Beck, the pharmacien in chief at the St. Jean Hospital, at Brussels, to which Dr. Corput is also attached, gives the following process for the preparation of this soap, of the medicinal efficacy of which he also speaks highly:—

Slaked Lime in fine powder . . .	600 grammes.
Cod-liver Oil	500 „
Rain-water	1700 „

The hydrate of lime is intimately diffused through twice and a half its weight of boiling water, so as to form a uniform fluid; the cod-liver oil is mixed in a copper dish with 200 grammes of hot water, stirring them intimately together, and incorporating little by little, with continuous agitation, the boiling milk of lime. The mixture is gradually heated to the boiling point, and maintained in

the ebullition, constantly stirring, until the lime has entirely appeared, and the soap has acquired a uniform yellowish colour, a firm homogeneous consistence. The mother-liquor which has become completely limpid is decanted, and the soap immediately washed with a large quantity of water, squeezing and working it with a large wooden spatula, until the washings pass away colourless and tasteless.

The soapy mass is then evaporated at a very gentle heat until it rises from interposed water. Thus prepared, this soap is in the form of a pliant flexible paste, having a consistence of soft wax. It has a yellowish-white colour and an insipid characterless taste. In a state of purity it is not gritty under the teeth, and shows no particles of lime when fractured. When prepared from a pure and refined oil it is completely odourless. It is insoluble in water, but is somewhat acted on by alcohol, ether, etc. When saponification has not been completely effected, treatment with water causes the separation of oily drops, and the filtered liquid is precipitated by the addition of ammonia. The author appears to indicate that care must be bestowed upon small points of manipulation in order to obtain an unexceptionable preparation.

The oil should be of the best quality, without admixture, and extracted from fresh livers at a low temperature. Particular care should be taken to have pure freshly slaked lime, free from silicious matter, and in a state of *impalpable powder*. To ensure this, it should be passed through a fine sieve before use. The proportions indicated should be rigorously observed, and the two substances should be intimately diffused through separate portions of hot water before mixing. As the resulting soap becomes brown and hard at the surface by exposure to air, it should be preserved either in tightly closed vessels, or beneath the surface of water.

The writers upon this soap state that it may be administered without occasioning any of the nausea and unpleasant effects caused by the natural oil. It is given in the form of pills or dragées, surrounded with oil of bitter almonds, and coated by an ethereal mixture of tolu, and afterwards rolled in powdered sugar. From five to ten of these are to be taken daily, two at a time, immediately after a meal. In certain cases morphia, aconite, henbane, or any other substance that is indicated may be associated with the soap.

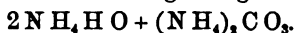
Spiritus Ammoniae Aromaticus. Dr. E. Divers. (*Journ. chem. Soc.*, viii., 261.) In the course of his exhaustive papers on the Carbonates of Ammonia, which we have already noticed

(page 130), Dr. Divers makes the following observations on the composition of the Pharmacopœial sal-volatile :—

Some pearlash, with fully its equivalent of sal-ammoniac, was distilled with aqueous alcohol, according to the directions of the London Pharmacopœia, for preparing *spiritus ammoniæ aromaticus*. The first portions of the distillate soon deposited crystals in the receiver. By allowing a sufficient quantity of fluid to distil over, these crystals redissolved. The distillate, as a whole, was a solution of normal carbonate. I tested it for carbamate, but failed to get evidence of its presence. The crystals deposited by the earliest portions of the distillate were very minute, but they reminded me of crystals of the normal carbonate. On letting stand some of the earlier portions of the distillate, of such a strength as only to form crystals slowly, a good quantity of very thin six-sided tables deposited, which, both by their appearance and behaviour on exposure to the air, proved to be half-acid carbonate. Acid carbonate was also formed. The mother-liquor was basic, or contained more than two atoms of ammonia to one of carbonic anhydride.

The *spiritus ammoniæ aromaticus* generally proves to contain caustic ammonia, and, I think, I cannot speak with certainty, not unfrequently much less carbonate than it is intended to contain. By following the directions in the British Pharmacopœia, to use solution of ammonia and commercial carbonate instead of pearlash and sal-ammoniac, the formation of a spirit containing excess of ammonia is favoured, but to only a small extent. The spirit thus obtained is, of course, equally liable, if too strong in alcohol, to decompose into a basic solution and half-acid or acid carbonate, as I ascertained by preparing it. During the distillation, crystals are apt to deposit in the neck of the retort, but they are soon dissolved again as the process goes on. In some further experiments, the author finds that when commercial carbonate of ammonia is distilled with spirit containing 90 per cent. of alcohol, ammonium carbamate condenses impregnated with aqueous alcohol.

Spiritus Ammoniæ Aromaticus. John T. Miller. (*Pharm. Journ.*, 3rd series, i., 742.) Some time back, the author noticed while distilling this spirit that ebullition was preceded by considerable effervescence. This fact led him to examine the composition of the distillate, which proved to be, as he had suspected, strongly basic,—a result which subsequent experience showed to be invariable. Indeed, so large is the excess of base in sp. ammon. aromat. B. P., that the author considers he is not far wrong in regarding it as a solution of



variations in the composition of the product, but not, probably, in any great amount, may be expected to attend different conditions of manufacture.

In a statement of Dr. Divers, that by following the directions in the British Pharmacopœia, "the formation of a spirit containing an excess of ammonia is favoured but to only a small extent," is very short of the mark in the author's opinion.

Spiritus Ammoniae Aromaticus. W. Martindale. (*Pharm. Journ.*, series, i., 704.) The author describes several experiments undertaken for the purpose of ascertaining what proportion of ammonia this preparation should contain. The result arrived at is that it is impossible for the distillate to contain more than about 1 per cent. of ammonia without it being deficient in carbonic acid.

Spiritus Salis Dulcis. (*Amer. Journ. Pharm.*) In reply to a correspondent in Newhaven, asking for a formula for *spiritus salis*, as used many years ago, the editor of the *American Journal of Pharmacy* says:—"It is a sweet spirit of (common) salt, just as sweet spirit of nitre is from saltpetre. Each was originally made by distilling the respective salts with sulphuric acid and alcohol. The name was officinal in the Edinburgh Pharmacopœia of 1722, and applied to a spirit of hydrochloric ether, obtained by distilling a mixture of one part of muriatic acid, and three parts of alcohol, and digesting the mixture for several days, and redistilling the product one or more times, until free from acid. This is probably what was used under that name."

In the Prussian Pharm. of 1847, a sort of spirit of chloric ether, under the name *spiritus etheris chlorati*, is made by distilling 10 parts of chloride of sodium, 6 parts of binoxide of manganese, 10 parts of sulphuric acid, and 48 parts of stronger alcohol, sp. gr. 1.2. The acid and alcohol are to be carefully mixed and poured over the salt and oxide, previously placed in a large retort, and the whole mixed; a well refrigerated receiver being adapted, 42 parts of distillate are obtained by means of a sand-bath heat. To free the product from acidity, it is shaken with about half a part of calcined magnesia till neutral, and then redistilled. Sp. gr. 1.15 to 1.20. This product has also been called *spiritus salis dulcis*.

The French use a preparation called *esprit de sel dulcifié*, which is a simple mixture of 1 part of muriatic acid and 3 parts of alcohol.

Preparation of Suppositories. W. G. Ewing. (*Amer. Journ. Pharm.*, xliii., 193.) The preparation of suppositories frequently occasions considerable trouble to the pharmacist. It is often

difficult to adjust the proportion of the fatty constituents so as to ensure the right consistency and a low melting point, at different seasons of the year; and if these are not attained at the first trial, much time is lost by remelting and cooling again, especially in summer weather. The author proposes to obviate this difficulty by preparing and keeping the cacao butter and wax in a coarse powder, and then, instead of melting the ingredients, rubbing them together in a mortar.

The powdering is effected as follows:—First, procure a large coarse tin grater, and with it grate the cacao butter into a coarse powder, pass this through a sieve No. 20, and put it into a wide-mouth bottle ready for use. Next, take some pure white wax, grate, sift, bottle, and preserve in the same manner. The fragments that will not pass through the sieve can be melted, and grated again after cooling. With these two substances any formula for suppositories can be, according to the author, quickly and easily dispensed.

The ingredients are weighed out, and at once mixed and rubbed together in a mortar; a plastic mass is formed which may be as easily rolled into lengths and divided as an ordinary pill mass, and each piece may be formed by the fingers into a conical shape, and pressed into a mould previously dusted with lycopodium. If the mass should be too hard, as in winter, the addition of a little olive oil is easily made; or if too soft, as in summer, the addition of more grated wax will bring it to the right consistence.

The author gives the following prescription as an example:—

℞ Carbolic Acid	grs. xxx.
Cacao Butter	ʒiiss.

Mix and make 10 suppositories.

If the carbolic acid and cacao butter are melted together, they will not solidify on cooling in warm weather. If wax be melted with the mixture, considerable time is occupied in adjusting the proportions, meanwhile the carbolic acid is evaporating, and the efficacy of the suppositories being impaired. Having the grated materials at hand, it is only necessary to rub in a sufficiency of wax until the proper consistency is attained.

On the use of Wax, Tallow, etc., in Suppositories. C. S. Eberle. (*Proc. Amer. Pharm. Assoc.*, and *Amer. Journ. Pharm.*, xliii., 128, 170.) Pure cacao butter may be asserted to be but rarely if ever met with in the drug market. The samples for sale vary sensibly in colour and consistency, and no positive rule for judging

ure article by cursory examination can be offered. A candid ion by several prominent manufacturers of the article, reveals t of its frequent adulteration; and since the extended demand le of this production for cosmetic and suppository application, ter variety of mixtures known as butter of cacao is to be than formerly.

pharmacist, however, but seldom applies it to uses other r the preparation of suppositories, the successful use of which ls upon a base, whose point of fusion will correspond to l heat, which can be handled readily when in form, and which xposure to the natural heat of the body will promptly liquefy, lt slowly, thus depositing quickly the medicating ingredient he surface to which it has been exhibited.

butter of cacao best suited for pharmaceutical use, is dirty white, inclined to yellow in appearance, firm under re, yet disposed to yield its surface when held in the hand by rnth thus imparted, fusing readily at or about 98°, setting y after fusion when exposed to cold, and, after such exposure, aining its original character at ordinary temperatures.

ao butter at 98° F. liquefies. This is more apparent in the a or vagina than by merely holding in the hand. The res made by the pharmacist with the cacao butter of the t, vary in their behaviour in proportion to the quantity character of the hardening ingredient used in connection t.

onsiderable proportion of cetaceum may be added without ally affecting the value of a suppository; at least 10 per cent., abined with the butter, will produce a suppository which ot be likely to be complained of by the medical profession, e slowness with which this alloy, so to speak, fuses, makes r the addition of any hardening substance a serious objection. eed promptness of action in the application of medicines ppository, which can be best secured by rapid liquefaction : excipient, and no mixture or single substance combines ential requisites so completely, as a good sample of so-called butter.

addition of wax to cacao butter is to be reprehended. While restriction, a mixture may be formed which will harden more ly, and bear more handling than the butter alone, the reflecting acentist will bear in mind the slowness of its fusion at animal and the consequent suspension of the medicine, which should used and deposited over as large a surface as possible.

Of the various mixtures, those of one-eighth spermaceti, or one-fourteenth or less of wax are least objectionable. Tallow, suet, or paraffin, produced no result not secured by the first mentioned, while there were some objections to be attached to their use not present in the others.

The following are the points of manipulation by which the author has obtained the most satisfactory result in preparing suppositories from cacao butter alone.

The mould is of brass; a clamp hinged at one extremity, and handled at the other, held firmly in place by a ring slipped over these handles; the cones are turned from the interior face of the clamps, as in an ordinary bullet-mould. It should mould at least one dozen, and be improved by the addition of a loose clamp, to be attached firmly in the centre and at the bottom of so long a tool, to prevent the loss of the fused mass before congealing, by running from between the plates.

This mould should, so far as possible, be thoroughly chilled and ready for use. To place the fused butter in the mould while it is warm, and cool both by the same operation, almost invariably results in the contraction of the metal upon the cool cone to a degree that upon the attempted separation of the matrix, every cone will be split in two. When the mould is thoroughly cooled, the butter sets rapidly, and in fifteen or twenty minutes the suppositories will drop from the matrices by their own gravity.

The deductions drawn by the author from a close observance of this subject for the past two years are, that the addition of a substance such as wax, spermaceti, etc., to cacao butter produces a mixture requiring a higher point of heat for its fusion, in proportion to the amount of such addition; but that when such addition is made, if it should not be sufficient to prevent the fusing of a suppository at animal temperature, no irritating or harmful effect is produced either upon the vagina or urethra. Where a larger quantity than that mentioned above is added, the annoyance produced requires the removal or ejection of the suppository before any harm may be done.

A New Material for Suppositories. T. Carre. (*Canad. Pharm. Journ.*) Mr. T. Carre, of Meaford, has communicated a formula for a new material for the administration of opium or other medicine by suppository. He says that in trials made upon patients suffering from hæmorrhoids he has found it, from its elastic texture, to possess advantages over other excipients used for a like purpose. Gelatine being one of the ingredients, it could not be used for making

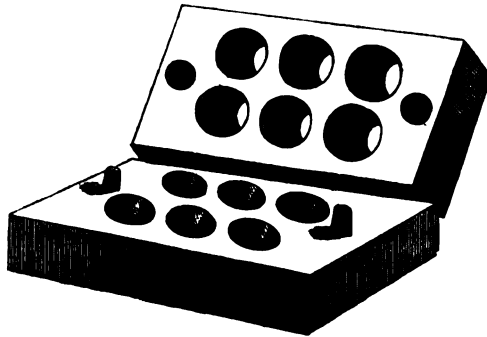
positories containing tannin, as an insoluble and inert substance could be formed. The following is the formula :—

Best Glue	4 oz.
Glycerine	8 oz.
Golden Syrup	2 oz.
Water	8 oz.

Soak the glue in the water until quite soft, then dissolve over a steam or water-bath. Mix the syrup and glycerine well together, add them to the glue solution, and boil until they lose about 2 oz. in weight; then pour out on an oiled tray, or into any suitable mould, previously removing any scum formed. The result is an elastic substance, which will keep for a long time, but dissolving more readily when fresh. When required for use the composition should be dissolved in a little water with gentle heat, the opium or other being mixed with it, and then run into a mould.

Improved Mould for Suppositories and Pessaries. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, i., 423.) Mr. Gerrard, the dispenser at Guy's Hospital, has introduced a new form of mould for suppositories which he considers to be simpler and cheaper than the one in ordinary use.

It is composed of two pieces of metal, one lying upon the other, kept in position by a pin at each end; the cavities for receiving the fat are drilled through the top into the bottom piece, the two



pieces thus forming a transverse section through the apertures. The two flat surfaces which meet together form a perfect joint, the weight of the top piece of metal being sufficient to keep it in position, so that none of the melted material can run between. The working of this mould is comparatively easy. Having poured in the

substance and allowed it to cool sufficiently, it is only necessary to lift the top piece from the bottom, which brings the suppositories with it, then a gentle pressure with the thumb easily removes them.

The author adds a few practical remarks on the successful use of the moulds, and the making of suppositories. Let the mould be perfectly clean, and as cold as possible before using. When pouring in the material, stir continually, otherwise the active principle will vary in each cone. In dealing with the material do not use too great a heat, or it will run together, forming a lumpy mass, which is unmanageable and useless. Various methods have been proposed to assist the removal of the cones, but from the author's experience nothing answers so well as the condensation of moisture obtained by breathing into the holes immediately after pouring in the fluids. If these precautions are neglected, whether this mould be used or any other, failure may be the result; it will not, however, be the fault of the machine, but of the operator. In this as in many other branches of our profession, success depends on the skill, dexterity, and common sense of the manipulator, which ensures perfect success.

Suppositories. A. E. Ebert states that when moulds of tin are employed, the main point necessary to ensure success is to have the moulds *thoroughly chilled* by ice before the addition of the melted material; when this is observed, there is no difficulty in removing the suppositories with ease, and within a few minutes.

Syrup of Cinchona. Use of Sugar in Preparations of Cinchona Bark. M. T. Defresno. (*Journ. de Pharm. d'Anvers*, 1856, 256.) The author points out the well-known fact that in addition to the alkaloids, existing chiefly as kinates, *Calisaya* bark contains astringent aromatic substance allied to tannin in its chemical characters, which has received the name of cinchonic red, and possesses decided tonic properties. When cinchona bark is treated with spirit, this cinchonic red is dissolved out together with the alkaloids; and the resulting tincture represents the full medicinal activity of the bark; but the addition of water precipitates the greater part of the cinchonic red as a reddish brown residue. Exposure to heat also affects this body, causing it to pass into an insoluble modification, in which state it is with difficulty dissolved by anything but the alkalies.

The author points out that cinchonic red, as it is first extracted from the bark, is easily and permanently dissolved by syrup of sugar, which when treated with water yields a

action of insoluble resinoid clots, forms with syrup a perfectly dark brown solution. The author has verified this solution chronic red in saccharine solutions in a variety of ways, and as it as an important fact, because it affords the means of preparing a syrup of cinchona which will not only contain all the acids of the bark, but will also possess all the aromatic tonic virtues of the cinchonic red.

In the process he appears to recommend is to exhaust 10 parts of cinchona bark by percolation with weak spirit (30°), and add to the percolate 10 parts of sugar, then evaporate till the liquor is reduced to 60 parts. This by cooling becomes troubled, and deposits its cinchonic red; but without filtering, 90 parts of sugar are added and dissolved by a heat not exceeding 50° C. The liquor becomes clear and remains permanently clear, forming a deep brown syrup, which never deposits, and possesses an agreeable, aromatic pleasant taste.

Syrupus Croci. G. W. Kennedy. (*Amer. Journ. Pharm.*, xliii., 1876.) This syrup, as commonly prepared, is apt to ferment; the author proposes to overcome this inconvenience by substituting glucose for part of the sugar. The following is the formula he recommends:—

R Saffron	½ oz.
Glycerine	2 oz.
Water	6 oz.

The above ingredients are to be macerated for seven days, then filter into a pint bottle, pass sufficient water through the filter to make the filtrate measure 8 oz.; add 14 oz. of sugar, and dissolve it in the cold with constant agitation. The result is a beautiful thick dark orange-red syrup, which, it is stated, will keep perfectly.

Syrups of Senega, Ipecac., and Squill. J. C. Wharton. (*Amer. Journ. Pharm.*, xliii., 101.)

Syrupus Senegæ.

R Senega, in moderately fine powder	4 troy ounces.
Sugar (refined), in coarse powder	15 troy ounces.
Diluted Alcohol	2 pints.
Water	a sufficient quantity.
Carbonate of Magnesia.	30 grains.

Macerate the senega with two fluid ounces of the diluted alcohol, transfer it to a conical percolator, and gradually pour upon it the remainder of the diluted alcohol. When the tincture has ceased

to pass, evaporate it by means of a water-bath, at a temperature not exceeding 160°, to half a pint. Rub it with the carbonate of magnesia in a mortar till thoroughly mixed, filter and add sufficient warm water through the filter to make the filtrate measure half a pint, and, having added the sugar, mix well together, and note accurately the measure of the mixture while cold; then dissolve the sugar with the aid of a gentle heat, strain the solution while hot, add sufficient warm water through the strainer to bring the syrup, when cold, to the previously noted measurement, and mix them thoroughly.

Syrup of Ipecacuanhæ (modified from former editions of the U. S. P.)

℞ Ipecacuanha, in fine powder	2 troy ounces.
Diluted Alcohol, Water	each, a sufficient quantity.
Sugar (refined), in coarse powder	29 troy ounces.
Carbonate of Magnesia	45 grains.

Moisten the ipecacuanha with one fluid ounce of the diluted alcohol, let it stand for twenty-four hours. Then transfer it to a conical percolator, and gradually pour upon it diluted alcohol until one pint of tincture has passed. Evaporate this by means of a water-bath to six fluid ounces, add ten fluid ounces of warm water, and, having rubbed it thoroughly with the carbonate of magnesia in a mortar, filter, and add sufficient warm water through the filter to make the filtrate measure one pint; then add the sugar, and dissolve it with the aid of a gentle heat, and having strained the hot syrup, add sufficient warm water, through the strainer, to make it measure two pints when cold. Similar directions are given for the preparation of the syr. scillæ co. of the U. S. P. [It may be questioned whether the use of carbonate of magnesia, which is the chief modification introduced by the author, is justifiable in these cases.]

Syrup of Ipecacuanha. (*Chic. Pharm.*, iii., 203). The following formula is sent to the *Chicago Pharmacist*, by Mr. L. E. Sale, of Huntsville, Alabama, who says that it will give a good syrup of ipecacuanha, which will keep without deterioration:—

℞ Fluid Extract of Ipecac. (U. S. P.)	℥ xvijss.
Granulated Sugar	℥ xxxij.
Water.	℥ xxxvj.

Pour the fluid extract of ipecacuanha on the sugar in a shallow evaporating vessel, and set aside in a warm place to dry; when dry

the water, dissolve the sugar with aid of gentle heat, and strain. Syrup thus prepared will measure 35 fl. oz., and will correspond in strength to the official syrup of the U. S. P.

syrup Tolutanus. (*Amer. Journ. Pharm.*, xlii., 504.) The writer gives the following method of preparing this syrup, which yields a preparation with a stronger flavour than that made according to United States Pharmacopœia.

First make a syrup with 26 troy ounces of sugar, and one pint of water; then take a well annealed bottle (sufficiently large) into which put 2 drachms of magnesia carbonate and 2 fluid ounces of tolu; shake well, add the boiling hot syrup, shake for a couple of minutes, and throw the mixture, hot as it is, on a paper filter. Of course, the funnel is covered with oiled silk, a glass plate, or a cover.

There are two objections to be made:—

First. The above method can only be followed at the imminent risk of bottles and funnel. If the bottles and funnel be rinsed out with hot water previous to using them, the risk is lessened considerably.

Second. Syrups filter very slowly. The hotter the syrup is, the quicker it runs through; a ribbed funnel, or, better, interposing several sticks of wood or glass rods between the filter and the funnel, lessens filtration a good deal.

Syrup of Phosphate of Iron, and other Syrups containing Phosphoric Acid. Michael Carteighe. (*Pharm. Journ.*, 3rd series, ii.) Of the numerous preparations of iron at the disposal of the practitioner few have in late years acquired more favour than this syrup of the phosphate. First introduced to the notice of the profession by Mr. Greenish* in a form more or less opaque, it was not until about ten years ago that it came into very general use. At this time Gale and Schweitzer each read a paper† at one of the evening meetings of the Pharmaceutical Society, detailing processes for the preparation of this syrup in a form which should remain perfectly bright and free from deposit. Gale's process was introduced into the British Pharmacopœia of 1867, and since the publication of that volume the demand for this medicine has vastly increased. Its tendency to darken in colour after having been kept some time was soon noticed, and Umney‡ made some experiments with the view of preventing or retarding this change, but the results were not practically satisfactory. T. B. Groves§ afterwards

* *Pharm. Journ.*, vol. x., p. 534. + *Pharm. Journ.*, 2nd series, vol. i., p. 497.

† *Pharm. Journ.*, 2nd series, vol. viii., p. 129. § *Pharm. Journ.*, vol. xi., p. 138.

examined a very old specimen in his possession, and determined the chemical composition of the precipitate which is formed on long standing. He describes this precipitate as being essentially a compound of iron with phosphoric acid, corresponding to the octocalcic phosphate of Warington. The dark colour he thinks due to the production of caramel by the action of the phosphoric acid and iron salt upon the sugar. He also prepared several specimens with a stronger acid, made by himself from amorphous phosphorus, and found that these kept somewhat better than when made according to the B.P.

The necessity of keeping the syrup recently prepared, induced the author to try a few experiments with a stronger acid, and to devise a shorter process than that of the B.P. This has doubtless already suggested itself to, and been practically tested by other chemists, but, so far as the writer is aware, it has not hitherto been published. It is as follows :—

Syrup of Phosphate of Iron.

℞ Phosphate of Iron	96 grs.
Water	9 fl. drms.
Syrupy Phosphoric Acid, sp. gr. 1·500 . .	7 fl. drms.
Syrup	10 fl. oz.

Rub the phosphate of iron with the water in a glass mortar, add the phosphoric acid, and filter the mixture into the syrup.

As thus prepared, it contains the same proportion of iron, about 2 minims less of the dilute acid (25 instead of 27), and rather more sugar than when prepared according to the Pharmacopœia.

The phosphate of iron is made by the B.P. process, and dried at a temperature not exceeding 100° F. The specimens found in the ordinary course of trade are not readily soluble in the acid. This want of solubility is probably due to the length of time they have been kept before sale.

The author has obtained the best results with phosphate only a few days old, and finds it advantageous to make as much as is required frequently.

Syrupy phosphoric acid of sp. gr. 1·500 may now be obtained of any manufacturing chemist, and according to Dr. Watts's table,* contains about 50 per cent. of P_2O_5 . It is made by the action of nitric acid on phosphorus, the excess of acid being driven off in a platinum vessel.

* *Pharm. Journ.*, 2nd series, vol. vii., p. 191.

Manganese is sometimes prescribed with or without iron, and according to Pereira, the former is a useful adjunct to ferruginous preparations, and occasionally a desirable substitute for them.

Syrup of Phosphate of Manganese

May be prepared in a similar manner with the following ingredients:—

R	Phosphate of Manganese	96 grs.
	Water	9 fl. drms.
	Syrupy Phosphoric Acid, sp. gr. 1·500	7 fl. drms.
	Syrup	10 fl. oz.

Strength.—1 grain phosphate of manganese, and acid equal to about minims of the dilute phosphoric acid in each fluid drachm.

The phosphate of manganese is made in the same manner as the phosphate of iron, substituting sulphate of manganese for the ferrous phosphate.

Syrup of Phosphate of Iron with Manganese.

R	Phosphate of Iron	72 grs.
	Phosphate of Manganese	48 grs.
	Water	8 fl. drms.
	Syrupy Phosphoric Acid	8 fl. drms.
	Syrup	10 fl. oz.

Mix the powders with the water, add the acid, and filter into the syrup.

Each fluid drachm contains $\frac{3}{4}$ grain phosphate of iron, $\frac{1}{2}$ grain phosphate of manganese, and acid equal to about 30 minims of the dilute phosphoric acid, B.P.

The tendency of modern practitioners of medicine to encourage the exhibition of substances which may assist in the formation of bone, etc., has led to the introduction of the—

Syrup of Phosphate of Iron and Lime.

R	Phosphate of Iron	96 grs.
	Phosphate of Lime	192 grs.
	Water	8 fl. drms.
	Syrupy Phosphoric Acid, sp. gr. 1·500	8 fl. drms.
	Syrup	10 fl. oz.

Mix the powders with the water in a glass mortar, add the acid, and pour into the syrup.

Each fluid drachm contains 1 grain of phosphate of iron, 2 grains of

phosphate of lime, and an amount of acid equal to about 30 minims of the dilute phosphoric acid, B.P.

The phosphate of lime is made by precipitation from solutions of chloride of calcium and phosphate of soda, and dried at 100° F., and should not be kept too long before use. That made from *bone ash*, as the Pharmacopœia directs, is much less readily soluble.

The following formulæ may be useful as an appendix:—

Syrup of Phosphate of Zinc.

℞ Phosphate of Zinc	192 grs.
Water	11 fl. drms.
Syrupy Phosphoric Acid, sp. gr. 1·500	5 fl. drms.
Syrup	10 fl. ounces.

Rub the phosphate with the water, add the acid, and filter into the syrup.

Each fluid drachm contains 2 grains of zinc phosphate, and about 18 minims of dilute phosphoric acid.

Syrup of Phosphate of Quinine.

℞ Phosphate of Quinia	96 grs.
Water	13½ fl. drms.
Syrupy Phosphoric Acid, sp. gr. 1·500	2½ fl. drms.
Syrup	10 fl. drms.

Mix the acid with the water, add the quinia, and filter into the syrup.

Each fluid drachm contains 1 grain of phosphate of quinine, and acid equal to about 10 minims of the dilute phosphoric acid.

Syrup of Phosphate of Iron with Quinine.

℞ Phosphate of Iron	192 grs.
Phosphate of Quinia*	96 grs.
Water	7 fl. drms.
Syrupy Phosphoric Acid, sp. gr. 1·500	9 fl. drms.
Syrup	10 fl. oz.

Rub the powders with the water, add the acid, and filter into the syrup.

Each fluid drachm contains 2 grains of phosphate of iron, and 1 grain of phosphate of quinine.

* The same weight of quinia, prepared by precipitating an acidulated solution of the *disulphate* by solution of ammonia, collecting, washing, and drying at 100° F., may be used, in the absence of the phosphate.

Syrup of Phosphate of Iron, Quinine, and Strychnine.
(*Easton's Syrup.*)

℞ Phosphate of Iron	192 grs.
Phosphate of Quinia*	96 grs.
Strychnia (in crystals)	3 grs.
Water	7 fl. drms.
Syrupy Phosphoric Acid, sp. gr. 1.500	10 fl. drms.
Syrup	10 fl. oz.

b the phosphate of iron with 5 drachms of the water in a glass mortar, dissolve the strychnia and quinia in the acid, previously mixed with the remaining 2 drachms of water; mix and filter into a syrup.

Each fluid drachm contains 2 grains of phosphate of iron, 1 grain of phosphate of quinine, and $\frac{1}{3}$ nd part of a grain of strychnine.

Syrup of Phosphate of Iron and Strychnine

may be prepared in the same manner as the last, omitting the phosphate of quinine.

Syrup of Phospho-lactate of Lime. Hager. (*Journ. de Pharm. Invers*, 1871, 123.) Dissolve 2 parts of lactate of lime in 60 parts of distilled water; add little by little, with agitation, 7 parts of phosphoric acid; after several hours, agitating from time to time, the liquid becomes clear; filter, and make the liquid up to 70 parts, then introduce 130 parts of sugar, and dissolve.

Syrupus Calcis Lacto-phosphatis. William Neergaard. (*Amer. Journ. Pharm.*, xliii., 243.) In the *Archives Générales de Médecine* for December, 1869, and for January and February, 1870, Dr. L. Duret recommends the use of a new preparation, which he terms the lacto-phosphate of lime, in which the lime salt is dissolved in free lactic acid.

Dr. B. W. M'Cready, of Philadelphia, requested the author to prepare a syrup containing that compound, and he adopted the following formula:—

℞ Concentrated Lactic Acid	℥j.
Magma of freshly Precipitated Phosphate of Lime	q. s.
Aquæ Fl. Aurant.	℥jss.
Aquæ Puræ	q. s. ad. ℥vjij.
Sacchari Albi	℥xj.

Mix the lactic acid with 2 fluid ounces of water, and saturate it with the magma. Put the liquid upon a filter, and add the rest of

The same weight of quinia, prepared by precipitating an acidulated solution of disulphate by solution of ammonia, collecting, washing, and drying at 100° F., may be used, in the absence of the phosphate.

the water until 8 fluid ounces of filtrate are obtained. Pour this upon the sugar, contained in a bottle; shake occasionally until solution is effected, and strain. No heat ought to be applied, else the syrup assumes a milky appearance.

The syrup thus prepared contains between 2 and 3 grains of dry phosphate of lime in each fl℥, besides the lactic acid.

Syrup of Iodide of Potassium and Iron (of Lahache). (*Journ. Pharm. d'Anvers*, 1871, 124.)

R	Iodide of Potassium	308 grains.
	Iodide of Iron (in solution 1 to 3) . . .	230 „
	Orange-flower Water	462 „
	Simple Syrup (concentrated) . . .	33½ fluid ounces.

Dissolve the iodide of potassium in the orange-flower water, add the other solution, and incorporate the syrup. Preserve it cool and free from light.

Tincture of Hyoscyamus. By M. Donovan. (*Pharm. Journ.*, 3rd series, i., 907, from *Med. Press and Circ.*) The author writes:—Some years ago I published, through the medium of the *Medical Press*, an account of trials made on myself and others, with a view to discover what dose of tincture of hyoscyamus should be given in order to produce its sedative effects. The experiment was made on several persons, beginning with a drachm dose, increasing it to six drachms, and in my own case to one ounce, of the tincture of the Dublin Pharmacopœia. In no case were any effects observed beyond dryness of the throat and fauces. The experiments were made with tinctures prepared from the dried leaves of garden-grown plants, from wild plants collected in a mountainous district of North Wales, and from the same leaves dried and undried.

I was under the impression that some of the plants employed in making the tinctures on which I experimented were in the second year of their growth, but the trials now to be described have convinced me that none of them could have been more than one year old. At that time I was not acquainted with the means which I have since discovered of testing the age of the plant.

I satisfied myself by these experiments that tincture of hyoscyamus prepared, as I believe it generally is in this country, from leaves of one year's growth, is all but powerless. I was strengthened in this opinion by finding that M. Hertz has given upwards of fifteen grains of the extract, most probably made from the plant in its first year, without any sensible effect.

Mr. Houlton had long before affirmed the inertness of the one-year-old plant, and the activity of that of two years old.

order to come to some determination on this subject, I adopted of procuring a tincture certainly made from the latter, and trials with it, soon convinced myself that it was an article of different value from a tincture of the one-year-old plant, and that my former experiments must have been made with the latter, when I was led to believe that, in some of them, the plant of two years growth had been used.

My first trial was on myself. I took one drachm, and for an hour felt no effect beyond dryness of the mouth. On a subsequent day I took two drachms, and in two hours had proof that I had a sufficiency. My sensations were indescribable: one was a

feeling of uncertainty of my steps in walking although they were quite steady, and a slight sensation of giddiness. This trial convinced me that I had taken as full a dose as prudence would

allow. To a lady who suffered from headache I gave, at her own request, one drachm of this tincture. In about two hours she felt so overcome by sleepiness that she could scarcely keep her eyes open; her headache was, however, greatly relieved. On another occasion I gave her a similar dose, and, being in bed, she soon fell into a refreshing sleep; and, on awaking, found that the headache was gone; but she complained of dryness of the fauces and throat, which on the first occasion she did not experience either of these

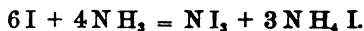
effects. Some months afterwards, the same lady suffered from headache, and did not receive any benefit from a similar dose; nor did another person experience any relief from toothache, nor was there any effect beyond slight dryness of the fauces, which soon passed off.

Convinced by the foregoing considerations that the medicinal properties of hyoscyamus reside exclusively in the plant of two years growth, and that the plant of one year's growth is therefore useless, I endeavored to discover an easy test by which the age of the plant, from which a given tincture had been prepared, could be determined. It now follows that allowing has at least the advantage of simplicity:—Add a little of the tincture to a glass of water; if the mixture become slightly turbid, the tincture was made from a two-years-old plant; if it remains transparent, the plant was in its first year.

British Pharmacopœia gives no information as to what shall be the age of the hyoscyamus from which the tincture is to be made; therefore, a matter of chance whether it will have any effect, or be useless. Given in the dose of twenty or thirty drops, as is sometimes done, it is hard to believe it can have any effect in either

The Decolorization and Deodorization of Tincture of Iodine. James Laker Macmillan. (*Pharm. Journ.*, 3rd series, i., 987.) Within the last year or two an unusual degree of attention has been devoted to methods for decolorizing tincture of iodine. The agent commonly resorted to for this purpose is ammonia; a practice which cannot be too highly censured, inasmuch as a change takes place which is highly detrimental to its medicinal properties. By the addition of ammonia to this tincture, one or more compounds of iodine and nitrogen are formed, which are thrown down in the state of a black precipitate, which is redissolved after standing for a number of hours, or by the addition of carbolic acid.

The reaction is as follows:—



Thus, it will be seen that the use of ammonia for this purpose is detrimental to the medicinal efficacy of the iodine; and that when such so-called tinctures prepared by this process are substituted for the tincture proper, the physician unwittingly uses a solution of the above compound. To rectify this error is the object of this notice; to which the author appends the following simple, though none the less noteworthy, processes, for the consideration of the pharmaceutical body at large.

Process, No. 1.—Potassium acetate ($\text{KC}_2\text{H}_3\text{O}_2$) 2.59 grammes, with 7.7 gramme solution of KHO , having a specific gravity of 1.06 at 15.55°C ., are capable of decolorizing 2.592 decagrammes of tincture of iodine, B. P.

Process, No. 2.—A similar reaction is manifest if treated with a solution of NaHO , having a specific gravity of 1.07 at 15.55°C ., in the proportions of 5.3 decigrammes of the sodium solution to 36 grammes of the tincture.

Tincture of Calabar Bean. A. E. Ebert. (*Chicago Pharmacist*, Dec., 1870.) Tincture of calabar bean is frequently prescribed, and there is considerable variation in its strength as dispensed by different pharmacists. The author prepares the tincture with 1 part of bean to 10 of liquid, the menstruum consisting of alcohol, 3 parts, and water, 1 part. The bean, previously reduced to a fine powder, is macerated for several days with the water, the alcohol is then added, and the whole is allowed to macerate 8 days longer. Finally, the mixture is thrown upon a filter, and when the liquid has ceased to pass, sufficiency of the alcoholic menstruum is poured upon the residue to make up the original measure. As there is some difficulty in powdering the bean with a pestle and mortar, the

author recommends the use of a coffee mill, which answers perfectly.

The dose of the tincture as usually prescribed, is 15 drops; equivalent to one-twentieth of a grain of the extract.

Tincture of Nux Vomica. J. P. Moore. (*Amer. Journ. Pharm.*, xliii., 106.) The tough and corneous character of nux vomica, and the obstacle thus offered to the solution of its active constituents, render it a most difficult substance to extract with a limited quantity of menstruum. The author having had frequent difficulty in thoroughly exhausting the drug and obtaining a satisfactory tincture by following the directions of the United States Pharmacopœia, recommends the following modification of the instructions; he lays especial stress upon the use of a very fine powder.

R. Powd. Nux Vomica, No. 80 . . . 8 ounces troy.
Alcohol a sufficient quantity.

Mix the powder with 1½ pints of alcohol, and digest for 24 hours, in a close vessel, at a temperature of 120°, with occasional agitation; then strain through muslin with strong expression, and rub the residue through a No. 20 sieve; pack it firmly in a glass cylindrical percolator, and gradually pour upon it the expressed liquid, and when it has all been absorbed, continue the percolation with alcohol until 2 pints of tincture are obtained.

He directs the mixture to be expressed at the completion of the digestion, as the residue can then be properly packed for percolation. This is of paramount importance to the success of the operation, and is much better than pouring the mixture into the percolator, and allowing it to settle and adjust itself, because in doing so the homogeneous condition of the mass is disturbed by the partial separation of the finer and coarser particles. The residuum should be packed so firmly in the percolator that, when percolation commences, the tincture will not pass at a faster rate than from 5 to 8 drops per minute. When the process is completed, the dregs in the percolator will be found to be tasteless or nearly so.

[It will be observed that the tincture of the U. S. P. is a much stronger one than that of the B. P.]

The Loss of Spirit in Making the Tinctures of the British Pharmacopœia. (*Pharm. Journ.*, 3rd series, i., 321-379.) The author gives the following table as embodying the result of his experience:—

	Quantity. made.	Alcohol '888 to make up measure.	Alcohol '920 to make up measure.	Loss p. c. by volume.	Gain p. c. by volume.
	Gals.	Pints.	Pints.		
Tinct. aconit.	4	2.5	...	7.9	
" arnicæ	10	3.0	...	3.8	
" aurantii	10	...	5.0	6.3	
" belladonnæ	2	...	.7	4.1	
" benz. comp.	5	...	...	...	10.0
" buchu	2	...	1.0	6.3	
" calumbæ	5	...	3.0	7.1	
" camphor. comp.	10	...	.5	.7	
" cantharid.	4	...	.6	1.9	
" capsici	5	1.0	...	2.5	
" cardam. co.	20	...	...	...	2.5
" cascariillæ	5	...	2.0	5.0	
" castor	2	.5	...	3.2	
" catechu	5	...	no loss	...	
" chirettæ	2	...	2.0	12.5	
" cinchonæ	10	...	12.0	15.0	
" " co.	10	...	9.0	11.3	
" cinnam.	5	...	4.0	10.0	
" cocci.	1	...	.25	3.1	
" colchic. sem.	2	...	1.5	9.4	
" conii	2	...	.75	4.6	
" croci.	1	...	.6	7.5	
" cubebæ	2	.5	...	3.2	
" digitalis	5	...	3.0	7.5	
" ergotæ	2	...	2.0	12.5	
" ferri acet.	1	1.2	...	15.0	
" gallæ	1	...	.4	5.0	
" gent. co.	10	...	7.0	8.7	
" hyoscyam.	10	...	6.0	7.5	
" jalapæ	5	...	2.0	5.0	
" kino	1	no loss	...	...
" krameriæ	5	...	2.0	5.0	
" lavand. comp.	20	2.0	...	1.3	
" limonis	2	...	1.5	9.4	
" lobeliæ	3	...	2.5	10.5	
" " æther.	3	*3.5	...	14.5	
" lupuli	5	...	4.0	10.0	
" myrrhæ	5	2.5	...	6.2	
" nuc. vomic.	4	2.0	...	6.2	
" opii	10	...	.75	1.0	
" " ammon.	2.5	.5	...	2.5	
" pyrethri	1	1.0	...	12.5	
" quassinæ	1	...	.7	8.7	
" rhei	10	...	4.0	5.0	
" sabinæ	2	...	.8	5.0	
" scillæ	5	...	3.0	7.5	
" senegæ	1	...	.75	9.3	
" sennæ	10	...	2.0	2.5	
" serpentar.	1	...	.9	10.9	
" stramon.	1	...	.5	6.3	
" sumbul.	3	...	1.0	4.2	
" valerian. am.	5	†3.5	...	4.4	
" valerian.	5	...	2.3	5.7	
" veratr. virid.	2	2.5	...	15.6	
" zingiberis	5	2.5	...	6.3	
" " fort.	10	3.6	...	37.5	

* Sp. æther. sulph.

Sp. ammon. aromat.

must always be remembered that the quantity of spirit required to make the measure of tinctures to a given bulk, will only be nearly uniform, in so far as the operators proceed under precisely the same circumstances.

causes will be found to influence results more than the manner of tinctures upon a small as compared with a large scale, and use of the screw as contrasted with the hydraulic press, in the removal of the spirit from the marc; even the difference between the temperature of summer and winter may cause a variation in the results.

The loss of alcohol noted in these tinctures has not been the subject of special experiment, but merely the memoranda made in the ordinary routine of manufacture. It may be well to remark that hydraulic pressure has always been used for the recovery of the spirit, when the quantity of ingredients has been sufficiently large to permit of its application.

	Gals.	Menstruum required p. c. by volume.	Ingredients occupy when in solution, filtered, and made to prescribed volume.
Tinct. aloes . . .	3	95	5 p. c. by vol.
„ guaiac. am. . .	3	92.7	7.3 „
„ toluani . . .	2	98	7 „

those tinctures in which the ingredients are directed to be added in a portion only of the spirit, and the measure finally made up when their solution has been effected, the percentage occupied by such ingredients occupy when dissolved and filtered has been determined; the difference therefore in volume will be the amount of menstruum required to produce the exact measure. To tinctures directed to be thus made in the Pharmacopœia, the undiluted tincture of benzoin might have been added, as a consideration in volume is produced by using the whole of the spirit for maceration.

Extemporaneous Benzoating of Ointments. Charles F. Johnson. (*Amer. Journ. Pharm.*, xliii., 145.) The author recommends the following preparation as a convenient one for extemporaneously benzoating ointments:—

R Benzoin Pulv. (select) ʒij.
 Ether Sulphuric ʒiv.
 Ol. Ricini ʒj.

Introduce the benzoin into an 8-ounce bottle, add the ether, macerate for 24 hours with frequent agitation, pass through a filter; to the filtrate add the ol. ricini, and shake until dissolved; then transfer to a shallow vessel, in order to allow the ether to evaporate spontaneously; lastly, when the ether has entirely disappeared, place in a wide-mouthed bottle ready for use. With a view to economy, the author experimented with alcohol and benzine as solvents; the former of the specific gravity .817 gave moderate satisfaction, the result being of a much darker colour, owing to the foreign matter in the benzoin being more soluble in alcohol than in ether; this was considered a serious objection, as it discoloured the ointment considerably, while that made with the ether did not, at least not more than if it were benzoated by the official process. The benzine experiment was a complete failure: it extracted from the benzoin only a very small amount of benzoic acid, leaving entirely undissolved the resin, cinnamic acid, and volatile oil. The result from the formula given above is of the consistency of a soft extract, 1 ounce of the extract fully representing an ounce of the benzoin in a state that is perfectly miscible with unctuous substances. Several ointments benzoated with this extract remained perfectly good for several months; and in the case of ung. hydr. oxidi rubri, the bright orange colour was perfectly preserved. The author has used it in the proportion of half a drachm to the ounce in several prescriptions, and it always gave perfect satisfaction. It can also be used very advantageously in preparations for the hair, it being very soluble in alcohol, and perfectly miscible with ol. ricini in combination with alcohol, but insoluble in the fixed and volatile oils in a free state. It is also freely soluble in chloroform.

Ointment of Mercuric Nitrate. R. Rother. (*Pharmacist*, iv. 5.) In an elaborate and valuable paper the author critically examines the pharmacopœial process for the preparation of this ointment, and afterwards introduces an entirely new method of operating, which he recommends, because it invariably yields a uniform and definite result. By the author's process, the formation of mercuric nitrate is effected with the requisite quantity of nitric acid, and the remainder is completely consumed in the oxidation of the fats. This ensures the ultimate existence of but one compound of mercury in the finished product, and that is, as the title implies, the mercuric nitrate. It likewise admits of the oxidation of the fatty matter to the utmost capacity of all the available nitric acid, so that when the last vestige of this has disappeared, the mercurial solution can be mixed with the nearly cooled product without causing any further reaction. A very

decided advantage of this process is that the enormously large vessels can be dispensed with. The nitric acid is added to the melted fat, and the heat continued until brisk ebullition sets in. This occurs mainly in the centre of the mixture, and without frothing. It is, however, of the utmost necessity not to disturb the liquids by stirring. If the reaction becomes too violent, the mixture must be moved a short time from the fire; and if the action slackens too much, it must be replaced. Finally, when all the nitric acid has been decomposed, the temperature can be considerably raised without causing any further effervescence. The boiling then is analogous to the boiling of fatty matters in general.

From the foregoing results the following formula is deduced:—

R. Mercury	1½ troy ounces.
Nitric acid, sp. gr. 1·42	3½ „
Lard (pure)	16½ „

Dissolve the mercury in 900 grains of the nitric acid, with the aid of heat, and keep the solution gently warm, to prevent crystallisation before it is used. Melt the lard in a suitable vessel on a moderate heat; then add the remainder of the nitric acid, and continue the heat, *without* stirring the mixture, as long as moderate effervescence continues; but if this becomes too violent, remove the mixture from the fire, and only replace it when the action slackens too much. Finally, when effervescence ceases and the liquid begins to boil, even under an increased heat, remove the mixture from the fire altogether; and when it begins to stiffen, add the mercurial solution, and mix it thoroughly.

Mr. Charles Fredigke, of Chicago, in preparing some of this ointment by Mr. Rother's formula, found that when effervescence ceased, and the liquid only boiled, even under increased heat (as the formula reads), it turned rapidly to a dark brown colour, and after cooling, and the addition of the mercurial solution, the ointment appeared of the colour of raw umber. On making a second trial, effervescence was allowed to go on very slowly, confining it to the centre of the liquid till it ceased. It had then a reddish brown appearance—lemon-yellow at the edge. At this stage it was kept at a temperature between 185° and 190° F., as indicated by a thermometer, and was briskly stirred with a wooden spatula, to ensure the complete liberation of nitrous acid fumes, and the reaction of the acid on the lard. The result was a most excellent ointment, both in colour and consistence.

Unguentum Hydrargyri Oxidi Rubri. By Henry A.

Bower. (*Amer. Journ. Pharm.*, xlii., 302.) All pharmacentists, have been annoyed (and that, too, at a time when it was most inconvenient to make this ointment up fresh) to find, when wishing to use it, instead of a fine red colour, it had changed, chameleon-like, to an olive-green or black.

A long time ago the author adopted the following formula, and has communicated it verbally to others, and he can safely say he has found the ointment so prepared never loses its beautiful redness:—

R.	Red Precipitate	3℥.
	Castor Oil	℥. 3i.
	Lard	3 vii. troy.
	Yellow Wax (orange colour)	3 ii. troy. M.

Melt the wax and the lard together and mix with the castor oil. On cooling, add the red precipitate in *very fine powder*, stirring constantly with a wooden spatula until cold.

Unguentum Sabinæ. T. H. Bateman. (*Pharm. Journ.*, 3rd series, i., 3.) The author points out that this ointment is now rarely used, and is therefore frequently met with in a most unsatisfactory condition, although some surgeons generally regard it as one of the best external irritants and escharotics. He thinks it desirable that Pharmacentists should prepare the ointment for themselves, rather than trust to the wholesale houses, and recommends the following formula, which is only slightly modified from that of the British Pharmacopœia:—

R.	Fresh Savin-tops (bruised)	8 oz.
	Yellow Wax	3 oz.
	Prepared Lard	16 oz.
	Gum Benzoin (coarse powder)	1 oz.

Melt the wax and lard on a water-bath, add the gum benzoin, and digest for half an hour, constantly stirring, then add the savin-tops, and further digest for twenty minutes; lastly, strain with pressure through calico or flannel, stirring occasionally until cold.

Resulting ointment, pale yellowish-green, with the odour of savin distinctly marked, which odour he has failed to detect in most, if not all, bought specimens. The addition of gum benzoin will prevent any decided change from taking place.

Ceratum Sabinæ. A. E. Ebert. (*Chicago Pharmacist, and Pharm. Journ.*, 3rd series, i., 566.) This excellent irritant cerate is but little used at present; indeed so seldom is it prescribed, that the dispenser is apt to find his stock on hand injured by exposure and age. The

he considers it preferable therefore to prepare this cerate extemporaneously, when required, and this can be readily done by keeping for the purpose the oleo-resin of savin, prepared by exhausting the resin with ether, and evaporating according to the U. S. P. formula for the cerate. By weighing the oleo-resin, and ascertaining the proportionate amount appropriate to each ounce of cerate, the two may be mixed whenever required.

Ointment of Iodide of Sulphur. A. E. Ebert. (*Chicago Pharm. and Pharm. Journ.*, 3rd series, i. 566.) The direction of the Pharmacopœia, "to reduce the iodide of sulphur to a fine powder, with the aid of the lard," has not proved practicable in the author's hands, and the process he has failed to reduce the iodide to the fine state of division essential to a good ointment. Several modifications have been proposed, as triturating with small quantities of alcohol, ether, carbon, and bisulphide of carbon; but these substances have no solvent action on the iodide; the use of the iodide of potassium has also been suggested, but this decomposes the iodide, and hence is objectionable. Oil of turpentine has been used, but he has found no success attending the use of oil of lavender as a solvent, and it being sufficient, and there can be no reasonable objection to its addition.

Ointment of Iodide of Sulphur. C. Fredigke. (*Pharmacist*, iv., 75.)

- R Simple Ointment, benzoated . . . 4 troy pounds.
- Carbolic Acid, crystallized . . . 3 ounces 96 grains.

To purify the acid by immersing the vessel containing it into hot water, and when the ointment is about congealing, add the acid, and agitate well with a strong wooden spatula.

Each drachm contains three grains.

This ointment has been of excellent service in treating large superficial wounds and ulcerated surfaces caused by burns, and in cutaneous eruptions of a parasitic nature.

Cucumber Ointment. L. E. Sale. (*Pharmacist*, iii., 234.) Dr. L. E. Sale, of Huntsville, Alabama, publishes the following simple formula for making cucumber ointment:—

- R Oil of Sweet Almonds 7 fluid ounces.
- Spermaceti 18 drachms.
- White Wax 5 drachms.
- Glycerine 1 fluid ounce.
- Green Cucumbers 4 lbs.

To prepare the cucumbers in small pieces, mash them in a wedgewood mortar, let them macerate in their own liquor for twelve hours,

express and strain; melt the almond oil, spermaceti, and wax together by means of a water-bath; add the strained liquor, stirring constantly, so as to incorporate the whole together. Set aside in a cool place (an ice-chest preferred) till it becomes hard, then beat with a wooden spoon to separate the watery portion of the cucumbers from the ointment; pour off the liquor thus obtained, and mix the glycerine with the ointment without the aid of heat by working it with the hands, until it becomes thoroughly incorporated. Put up in four-ounce jars, cover with a layer of rose water, and set aside in a cool place. The ointment prepared in this way will keep sweet and nice for twelve months.

Vinum Cinchonæ. M. Rabelle. (*L'Union Pharm.*, 1870, xi, 161.) M. F. Defresne has shown that "cinchonic red" is easily soluble in saccharine liquids. M. Rabelle has proposed a formula for making cinchona wine, in which the bark is first treated with a solution of sugar. His process is the following:—Powdered yellow cinchona, simple syrup, water—of each 30 grammes. Macerate for an hour in a water-bath, and add Bordeaux wine, 1000 grammes. After two or three hours maceration, filter. The sugar is not present in sufficient quantity to be tasted in the wine.

On the use of Tinfoil for Preserving Substances Liable to Change on Exposure to Air. Ernest Baudrimont. (*Journ. de Pharm.*, 4th series, xi, 385.) Tin reduced to thin sheets has for many years been employed for preserving a great number of substances from the action of air and moisture. The thin leaves (foil) of this metal are essentially repellent of moisture. When cemented to the surface of damp walls, they protect the paperhangings which may be afterwards applied, and they are in like manner used for lining the interior of boxes and drawers in which dried medicinal leaves and flowers are kept. It has long been the practice to enclose chocolate in tinfoil, to prevent the fatty matter contained in it from soiling the paper which forms the outside wrapper; in the same way butter of cacao itself is preserved, and some sorts of sweetmeats, sausages, and cheese are among the articles similarly protected. Tobacco-pouches are lined with tinfoil to preserve the flavour and humidity of the tobacco. Cakes of opium are kept in a moist and uniform state by wrapping them in this material, and bisulphate of soda is kept in the same way, for use in making artificial Seltzer-water with Briet's apparatus. Lastly, on account of the opacity of tinfoil to the rays of light, bottles are coated with it for the purpose of excluding light from vegetable substances which would be injured by its action.

Notwithstanding the knowledge of these facts, it might be said that the application of tinfoil for the preservation of substances liable to change is still rather limited, and there seemed to be a respect of its admitting of a more general use than has hitherto been made of it. At the same time there was an absence of any precise experiments for the purpose of determining in a scientific manner the degree of impenetrability of tinfoil. Having been engaged for some time in the investigation of this subject, the author has obtained the following results:—

For many years past he has observed that cacao butter, which readily becomes rancid even when kept in bottles into which it has been introduced in the melted state, if the bottles be opened from time to time, does not undergo the same change when moulded in sheets and wrapped in tinfoil. This fact, which was confirmed by many observations, and could not be explained by assuming the impenetrability of tinfoil to atmospheric air, formed the starting-point for some experiments in the same direction, which proved satisfactory. Thus, a piece of well-burned quicklime, enclosed in a double wrapper of tinfoil, was exposed to the atmosphere of the laboratory by the side of another similar piece which was exposed without protection. While the latter became slacked, that which was protected by the tinfoil, and weighed 92·2 grammes on the 1st December, 1867, had only gained 3 decigrams in weight at the expiration of a month, and after being kept until the 25th of March, 1868, it had only increased to 94 grammes. It had thus gained only 1·8 grammes in four months. On being then taken out of its tinfoil envelope, much heat was developed from absorption of moisture, and it fell into powder.

Satisfied by this experiment of the efficacy of tinfoil for preventing bodies from the action of air and moisture, it seemed probable that substances the most susceptible of change might be kept in the same way. It was found that substances so deliquescent as chloride of calcium and liver of sulphur, and efflorescent salts such as carbonate and sulphate of soda, remained almost unchanged when wrapped in tinfoil, increasing or diminishing only to a few hundredths of their weight in several weeks.

Other experiments were made of a more precise character. It is well known that fresh lemons become rapidly dried and ultimately shrivel when exposed to the air, and that they also become perished and covered with mould. The author had endeavoured to prevent this drying and moulding by placing the lemons in close vessels, in dry sand, in bran, and also in bran, but none of these methods proved

efficacious. Thus, for example, in twenty-one days the lemons on an average, 17·33 per cent. of their weight in sand, and per cent. in bran. Experiments were made for the purpose of ascertaining the effect of enveloping the fruit in tinfoil, and of coating it with a film of collodion. Some of the fruit prepared in each way, and some unprepared, was weighed, exposed to the air, and again weighed at intervals of a month. This method was applied to lemons and oranges, and the following results were obtained :—

1. The unprepared fruit became rapidly dried. In two months the lemons had lost 42 per cent. of their weight, while the oranges in the same time, had lost only 26 per cent.

2. Collodion, when applied to the fruit alone, exerted but a feeble preservative influence in retarding spontaneous evaporation. In two months lemons coated with collodion had lost 29 per cent., and oranges 22·5 per cent.

3. Tinfoil almost entirely prevents the drying of the fruit. In two months lemons lost only 1·58 per cent., and in three months 3·16 per cent. In one case, indeed, the loss was only 0·92 per cent. during the longer period. Oranges lost about 5 per cent. in three months. On the removal of the metallic envelope, the fruit was found to be as fresh and fragrant as when the experiments were commenced. These observations and experiments will tend to illustrate the remarkable power of tinfoil in preserving substances and in protecting them from the influence of air, and may induce those who are interested in the subject to extend the application of this preservative means.

Lead in Tinfoil. A. Vogel. (*Repertorium für Pharmacie, Buchner*.) Tinfoil very rarely indeed consists of pure tin; generally it contains more or less lead. According to the recent analysis of August Vogel, who has examined a great number of samples from very different sources, it contains from one to nineteen per cent. of lead. There are, however, specimens of tinfoil which contain so little lead that it hardly gives a reaction with the appropriate tests. As tinfoil is so much used for covering articles of diet, or of confectionery, or of perfumery, it was a matter of some degree of interest to determine whether or not there was any danger of transfer of lead from the wrapper to the contents. A number of experiments on soap, chocolate, and different kinds of dry sugar, which had been enveloped in tinfoil very highly charged with lead, showed that there was no contamination with lead. Cheese, on the other hand, did take up lead.

NOTES AND FORMULÆ.

PART IV.

NOTES AND FORMULÆ.

Palatable Hydrate of Chloral. *The Richmond and Louisville Medical Journal* recommends the following:—

R.	Hydrate of Chloral	$\frac{1}{2}$ drachm.
	Chloroform Water	2 drachms.
	Syrup of Orange or Tolu	1 to 2 drachms.
	Tincture of Ginger	6 to 12 drops.
	Water	to make $1\frac{1}{2}$ ounces.

The chloroform water is prepared by dissolving half a fluid ounce of chloroform in a gallon of water. This seems to intensify the action of the chloral, and covers the acrid taste.

Mr. A. W. Postans recommends to make a syrup with concentrated orange-flower water, dissolve in it the hydrate of chloral and add 5 minims of spiritus chloroformi to each drachm.

A correspondent of the *New York Druggists' Circular* says that the taste of chloral hydrate may be successfully disguised by the addition to a solution of the chloral of a little simple syrup and a few drops of oil of sassafras.

Syrup of tolu, syrup of orange peel, and of orange water, are also used; peppermint water has been recommended. Equal parts of syrup and chloroform water seem very efficient.

Chloroform as a Means of Improving the Taste of Cod-Liver

Dr. Hager. (*Neues Jahrbuch f. Pharmacie, Vorwerk, Jan., 1871*.) The author states that the addition of 10 drops of chloroform to 100 grammes of cod-liver oil renders that fluid perfectly agreeable to the palate, without in the least impairing its good quality, or interfering with its effect on the human frame.

Removal of the Odour and Taste of Cod-Liver Oil. Carlo Vesici. (*Giornale di Farmacia, and Journ. de Pharm. d'Anvers, 1870, p. 314.*) The author finds that the disagreeable odour and taste of cod-liver oil are completely removed by digesting it with roasted coffee and a little animal charcoal. The following is the method of operating he adopts:—

20 parts of cod-liver oil, 1 part of ground roasted coffee, and $\frac{1}{2}$ part of ivory black are mixed together in a glass flask, which is

loosely closed and heated in a water-bath to 50° or 60° C. for a quarter of an hour; then allowed to stand, with occasional agitation, for 3 days, and filtered. An amber-coloured limpid oil is obtained, having a slight odour and taste of coffee, and in which the fishy character is masked or removed. The therapeutic properties are not at all affected. If desired, a small quantity of iodine may be added to the mixture, to produce an ioduretted oil; but in this case the animal charcoal should be omitted.

Administration of Quinia. J. B. R. Purnell. (*Amer. Journ. Pharm.*, xliii., 51.) In this paper the author discusses the best means of concealing the bitter taste of quinine. Extract of liquorice answers well (5 grains for each grain of sulphate of quinine) with some patients; but the taste of the liquorice is in itself often objectionable. Tannic acid conceals the bitterness entirely when used in the proportion of 8 grains for 10 grains of quinine; it is better, however, to use less and add some aromatics. The tannin precipitates the quinine, which is really therefore given in mixture rather than in solution; the author has ascertained that its medicinal effect is not thereby impaired. A strong decoction of good coffee, while it adds to the antiperiodic effect, disguises the taste of a large proportion of the sulphates of quinine and cinchonine, without affecting their medicinal properties. In all these cases the use of an acid to dissolve the quinine is to be avoided. Coffee is also said to be an important agent in disguising the taste of senna and Epsom salts.

Application of Permanganate of Potassa. (*Amer. Journ. Pharm.*, xliii., 230.) The solution of this salt is readily decomposed by organic matter generally, and particularly by vegetable tissues. Some time ago Prof. Boettger found that this solution may be filtered through guncotton without decomposition; and recently he suggested the latter substance as suitable for applying the permanganate solution as an antiseptic in dressing wounds, ulcers, etc. This mode of application has proved eminently successful, the bad odour of suppurating wounds disappearing almost instantly.

Injection of Permanganate of Potash. (*Lancet*, 1870, ii., 779.) Dr. Warden recommends the use of permanganate of potash in the treatment of gonorrhœa and gleet. He employs an injection containing from 5 to 15 grains of the pure salt dissolved in an ounce of water.

Sulphurous Acid for Chilblains. Dr. Fergus recommends the treatment of chilblains with sulphurous acid. The acid should be applied either with a camel-hair brush, or better by means of a

producer. One application by the latter method usually is a cure. A good wash for hands or feet affected with chilblains is sulphurous acid, 3 parts; glycerine, 1 part; and water, 10 parts.

Remedies for Chilblains. (*Notes and Queries, Pharm. Journ.*)

I. (R. T. GIRDLER.)

R	Lin. Belladonn.	. . . . .	2fl. drs.
	Lin. Aconiti	. . . . .	1 "
	Acid Carbolic	. . . . .	10 "m
	Collodion Flexile	. . . . .	ad 1 oz.

x. and apply with a camel's hair brush. The above is for open chilblains; if they are broken, the lin. aconiti is to be omitted.

II.

R	Tinct. Cantharides,	
	Liq. Ammonis,	
	Lin. Saponis, aa.	M.

III.

R	Tinct. Aconiti	. . . . .	1½ dr.
	Glycerine	. . . . .	2 drs.
	Lin. Camph. Co.	. . . . .	4½ drs.

x. To be used every night if the skin is not broken.

IV.

R	Terebinthinæ	. . . . .	½ oz.
	Sp. Camphoræ, Liq. Plumbi Subacet.	. . . . .	aa 2 drs.

x. To be applied night and morning with a camel's hair brush.

V.

R	Liq. Potassæ	. . . . .	1½ dr.
	Potass. Cyanid.	. . . . .	8 grs.
	Aq. Camph.	. . . . .	ad 8 oz. M.

VI.

R	Ol. Terebinth.	. . . . .	2 drs.
	Liq. Ammon.	. . . . .	1½ oz.
	Lin. Saponis	. . . . .	3 oz.
	Sp. Rosmar.	. . . . .	1 oz.
	Acet. Destil.	. . . . .	8 oz.

Chilblains. (*Wiener Medizinischen Wochenschrift.*) M. W. E. Haller says that the fluid concentrated chloride of iron is an excellent remedy for chilblains, its application to them for a single day effecting a cure. It may also be used with advantage for frost-bites.

Remedy for Warts. The best caustery for warts is said to be dichloroacetic acid. It must be applied on the sharp point of a stopper.

made for the purpose; and great caution ought to be observed not to use too much of it, as it will eat a deep hole into the flesh. One application is frequently sufficient to drive away a wart.

Carbolic Acid Solution for Burns. Dr. A. D. Binkerd, writing the *Philadelphia Medical and Surgical Reporter* (July 9th, 1870) prefers, as an application to burns when first seen, carbolic acid and glycerine, in the proportion of from five to ten drops the former thoroughly incorporated with two ounces of the latter, spread on with a camel's hair or other light brush; then a layer of raw cotton, over which a woollen bandage is neatly adjusted. The administration of from a fourth to half a grain of sulphate of morphia, as early as practicable, has been productive of decidedly beneficial results. For the suppuration following burns, he recommends the following dressing:—Yellow wax, melted and strained, 3; raw linseed oil, 3iij.; tannin, 5i.; subnitrate of bismuth, gr. x. The wax must be first melted; the oil must then be added, and the whole stirred until incorporated; next the tannin is added, and lastly the bismuth. The ointment is applied on pieces of lint.

Antidote to Carbolic Acid. Sweet oil or castor oil swallowed in large quantities, is recommended as the most efficient antidote to carbolic acid, when it has been taken in poisonous doses.

Tannin and Glycerine Pencils. (*Lancet*, 1870, ii., 516.) Dr. Schuster states that tannin mixed with glycerine at first forms a soft waxy substance, which soon becomes hard and brown, and melts in a moist atmosphere at the temperature of the body.

Dr. Schuster has formed small pencils of this compound, which he inserts into the urethra of patients suffering from gonorrhœa.

He has found the treatment by means of caustic injections (the abortive method) frequently to fail, and that it occasionally produces violent pain, inflammation, and hæmorrhage. On the other hand, the treatment with slightly astringent solutions cures the gonorrhœa within a period varying from four to seven weeks, but is often followed by a troublesome gleet. The tannin-glycerine rods employed by Dr. Schuster, are from three to four inches in length, well rounded at the extremities, and consist of thirty grains of tannin, one grain of powdered opium, and a sufficient quantity of glycerine to form a pastille. These rods are hard in winter, and soft in summer. Before their introduction, they should be dipped in warm water. They are to be left for from five to ten minutes in the urethra, and then withdrawn. As a rule, they produce no pain. If, however, they be left in for an hour or for a night, more or less pain is caused: and this appears to be due to a combination occurring between the

and the mucus or pus, which becomes hard, and acts like a body. Dr. Schuster has had no case of orchitis following the use of these pencils, though he has thought it advisable to recommend the employment of a suspensory bandage; nor has he noticed irritation of the bladder or prostate. In cases of gleet, a rod is left in for a few minutes, and a speedy cure usually results.

Utile of Sulphate of Copper. M. Herbelin, of Nantes, rubs a rod of copper on a moist stone covered with fine sand, until a crust is produced.

Seaweed as a Remedy for Hay Asthma. A correspondent in the *Lancet* reports the case of a patient who has for several years suffered from this malady, but found no permanent relief from any of the usual remedies. The following treatment, however, proved efficacious:—A small barrel of seaweed, taken fresh from the shore, was given to the patient to sniff whenever an attack came on. Five days' inhalation of the seaweed sufficed to stop the symptoms, which the barrel was securely closed, and placed in a cellar for future use. It is suggested that the active principle of the seaweed (to obviate the cumbersome device of the barrel) be concentrated into a smelling-bottle; and this idea has been carried out with success. Such a pocket-companion might prove serviceable to those whose liability to hay-asthma is not proof against the pollen of the flowers which decorate dinner-tables and drawing-

Veratrum and Strychnine. Dr. Liebreich establishes a comparison between these two substances, in the *Berliner Kl. Woch.*, No. 43, and finds that they neutralise each other. As the symptoms produced by strychnine are very similar to those of tetanus, Veratrum would be a sovereign remedy for the latter, if its effects could be made to extend longer than the pathological irritation which gives rise to tetanus. Great improvement is, however, obtained by using Veratrum, as it seems to change the form of the complaint from the acute to the chronic, a change very likely to be followed by a cure. It should be given in the form of enema, and the dose may vary from 37 to 75 grains. Full doses should be given at once. Veratrum injections are only exceptionally to be used; but the author states that his injections with the platino-iridium syringe were followed by abscess.

Use of Quinine for Hypodermic Injection. G. G. Rogers, M.D. (t.) The author cites several cases of ague which were cured with quinine administered hypodermically. An aqueous solution of the crystals of neutral sulphate of quinine was em-

ployed, containing 1 grain of the salt in 30 minims. The quantity of the solution injected ranged from 29 to 30 minims. The ordinary disulphate of quinine is inadmissible, because a sufficient quantity cannot be brought into solution without the use of free acid.

Calomel for Hypodermic Use. (*Lancet*, 1870, ii., 716.) M. Scarenzio and M. Ricordi report a hundred and four cases of various forms of syphilitic disease, occurring in both sexes, at all ages, and pursuing divers occupations, in which the treatment by the hypodermic injection of calomel was adopted with marked success. Thus out of eighty-five cases of primary disease there were seventy-nine complete recoveries, three partial, and three deaths, of which two had no relation to the plan of treatment pursued.

The authors employ calomel suspended in gum or glycerine and water. The quantity injected varied from about three to fourteen grains. Slight salivation occurred in two instances only. The suspended calomel was injected by means of a Pravaz's syringe in the ordinary method; and although any part of the body may be selected, they prefer the outer part of the leg or forearm, or the side of the chest.

Hypodermic Injection. The Committee appointed by the Royal Medical and Chirurgical Society to investigate the hypodermic method of administering medicines, reports as follows:—

1. That, as a general rule, only clear neutral solutions of drugs should be injected.
2. That, whether drugs be injected under the skin or administered by the mouth or rectum, their chief physiological and therapeutical effects are the same in kind, though varying in degree; but
3. That symptoms are observed to follow the subcutaneous injection of some drugs which are absent when they are administered by other methods and, on the other hand, certain unpleasant symptoms which are apt to follow the introduction of the drugs by the mouth and rectum, are not usually experienced when such drugs are injected under the skin.
4. That, as a general rule, to which, however, there are many exceptions, neutral solutions of drugs, introduced subcutaneously, are more rapidly absorbed and more intense in their effects than when introduced by the rectum or mouth.
5. That no difference has been observed in the effects of a drug subcutaneously injected, whether it be introduced near to, or at a distance from, the part affected.
6. That the advantages to be derived from this method of introducing drugs are—rapidity of action, intensity of effect, economy of

terial, certainty of action, facility of introduction in certain cases, and, with some drugs, avoidance of unpleasant symptoms.

In commenting on this report, the *Medical Times and Gazette* marks:—

"We may safely take, as a broad guide in practice, the rule that the physiological activity of nearly every substance which can thus be used, is three, if not four times greater when it is given by the in, than when it is swallowed." The proper commencing dose of strychnine is $\frac{1}{150}$ grain of the sulphate. The dose of atropine is so $\frac{1}{150}$ grain at first. The dose of morphia is $\frac{1}{10}$ to $\frac{1}{2}$ grain.

The circumstance, that the action of medicines administered hypodermically is very rapid and often instantaneous, renders the method invaluable in certain cases; as, for instance, in cases of poisoning.

Styptic Wool. (*Lancet*, 1870, ii., 685.) Dr. Ehrle, of Isny, prepares this by boiling the finest carded wool for half an hour or a hour in a solution containing four per cent. of soda, then thoroughly washes it out in cold spring water, wrings and dries it. The wool is thus effectually purified, and is now capable of imbibing fluids uniformly. It is then to be dipped two or three times in fluid chloride of iron diluted with one-third of water, pressed and dried in a draught of air, but not in the sun or with the aid of high heat; finally it is carded out. Thus prepared, it is of a beautiful yellowish-brown colour, and feels like ordinary dry cotton wool. As it is highly hygroscopic, it must be kept dry, and when required to be transported must be packed in caoutchouc or bladder. Charpi may be prepared in a similar manner, but, on account of its coarser texture, is not so effective as cotton wool, presenting a less surface for producing coagulation. When the wool is placed on a bleeding wound, it induces moderate contraction of the tissue, coagulation of the blood that has escaped, and subsequently agulation of the blood that is contained within the injured vessels, and thus arrests the hæmorrhage. The coagulating power of the chloride of iron is clearly exalted by the extension of its surface as it is in this way effected. The application of the prepared wool is not particularly painful, whilst, by sucking up the superfluous exudate and preventing its decomposition, it seems to operate favourably on the progress of the wound.

Aromatic Essence of Ginger. W. R. Jones. (*Amer. Journ. Pharm.*, xliii., 159.) The author gives the following formula, which makes a very agreeable form of tincture of ginger:—

R	Ginger	12 oz.
	Cinnamon	1 oz.
	Cardamom Seed	½ oz.
	Clove	3 drms.
	Capsicum	2 drms.
	(All in moderately coarse powder.)	
	Alcohol	4 pints.

Tinctura Opii Camphorata (U. S.) The following formula is the extemporaneous preparation of tinctura opii camphorata published by Mr. W. Ramstead Jones, in the *Amer. Journ. Pharm.*:—

R	Tinct. Opii	ʒiij. ʒjss.
	Sp. Camphoræ	ʒj. ʒiij.
	Ol. Anisi	ʒij.
	Acid. Benzoic	ʒij.
	Alcoholis, q. s. ft.	Oij.
	Mel. Despumat.	ʒiv. troy.
	Aquæ, q. s. ft.	Oij.

Mix the two solutions together, and filter through paper.

Liquor Sedativus. C. Fredigke. (*Pharmacist*).

Tinct. Opii Camphor.
Spts. Æth. Nit. Dulc.
Spts. Mindereri.
Syr. Simpl.
Aq. Camphoræ, ana. part. æq.

M. et ft. solutio. Dose: A teaspoonful.

To increase the therapeutic effect of this mixture, 2 fl. ʒ of tinct. gelsemini, or 1 fl. ʒ of tinct. verat. vir., are often added to 6 ounces, to meet particular indications. This is a combination of prescribed in diseases complicated with febrile symptoms.

Holbeck Tincture. (*Pharm. Journ.*, 3rd series, i., 799.)

R	Tr. Rhei Co.	ʒiij.
	Tr. Cardam. Co.	ʒj.
	Tr. Opii	ʒss.
	Sp. Vini Rect.	ʒiss.
	Aquæ Puræ	ʒij.

This is a Leeds form, taking its name, from a place called Holbeck near Leeds. It is a stimulant and partly antispasmodic; the should be regulated by the quantity of tr. opii it contains.

Rubini's Camphor. (*Pharm. Journ.*, 3rd series, i., 397.)

R	Alcohol	1 part by measure.
	Camphor	1 part by weight.

Let the alcohol be prepared in the following way:—

R	Sp. Vini Rect.	ʒxx.
	Pot. Subcarb.	ʒj.

gest for 24 hours, and pour off the supernatant liquor, rejecting residue.

tch Drops or Haarlem Drops. (*New York Druggists' Circular.*)
is a considerable difference in the ingredients and quality of long-celebrated drops, but the most common preparation, ps, is according to the following formula:—

R	Balsam of Turpentine	2 oz.
	Oil of Turpentine	10 oz.

x. The genuine drops are the residuum of the rectification of turpentine.

amentum Rubrum. F. J. Machin (*Pharm. Journ.*, 3rd series, 7.)

R	Ol. Succini Rect.	℥xx.
	Ol. Carui	3j.
	Ol. Terebinth.	3ij.
	Ol. Rubri	3iv.
	Otto Rosæ	gtt. iv.
	Ol. Lini	ad. 3xvj.

l. ft. Linimentum.

ite Oils. (*Pharm. Journ.*, 3rd series, i., 737.)

I.

R	Ol. Terebinthinæ	3v.
	Ol. Lini	3vij.
	Sp. Camph.	3ss.
	Sp. Æth. Nit.	3j.
	Tr. Opii	3j.
	Mellis	3ij. M. s. s.

II.

R	Ol. Terebinthinæ	3vj.
	Liq. Vol. C. C.	3vj.
	Ol. Rapæ	3vj.
	Ol. Origani	3iv.
	Lin. Sapon.	3ij.

g. Aq. Rosæ. Mr. H. E. Godfrey recommends the following formula for this ointment, and thinks that, as medical men ionally order such an ointment, it should be introduced into 'harmacopœia:—

R	Ceræ Albæ	3j.
	Cetacei	3ij.
	Olei Amygdalæ	fl. 3x.
	Aquæ Rosæ	fl. 3ij.
	Tinct. Benzoini	℥xx. F. s. s.

e benzoin and the small quantity of aqua render it less liable ange than would be the case were the former omitted or the

latter augmented, and that is a desideratum in a pharmacopœial preparation.

Succinate of Sesquioxide of Iron. (*Pharmacist* iii., 212)

Having met with this compound once or twice in prescriptions, we copy the following process for its preparation from the *Chicago Pharmacist*, where it is given in an answer to a correspondent:—

R	Succinic Acid	3vi.
	Acetate of Soda	3xii.
	Solution of Ter-sulphate of Iron	fl. 3xxviii.
	Water of Ammonia, Water	aa q. s.

Dissolve the succinic acid in fl. 3viij. of water, and exactly neutralise it by the cautious addition of water of ammonia; in this solution, dissolve the acetate of soda. The next step in the process is to neutralise any excess of acid in the solution of ter-sulphate of iron; this is effected by adding to the solution, water of ammonia, a few drops at a time, and shaking after each addition; the oxide at first thrown down will redissolve upon agitation of the fluid, and the addition of ammonia is to be repeated until a slight permanent precipitate appears. Then add to the solution sufficient water to make it measure one pint, filter, and mix the clear fluid with the solution first prepared. The succinate of iron will appear as a precipitate; wash this with water, by decantation, to remove salts of soda and ammonia; drain the magma in a filter, and, finally, allow it to dry in the air.

The acetate of soda is employed to render the precipitated succinate of iron more dense than it would otherwise be; without this precaution it would be so light and finely divided as to render washing almost impossible. It is necessary to use perfectly neutral solutions to avoid loss, or contamination of the product with sesquioxide of iron.

Honey of Rhatany Root. (*Amer. Journ. of Pharm.*, xlii., 512)

Treat 300 parts of rhatany with 1000 parts of boiling water to obtain a decoction; strain; add 800 parts of white honey, and concentrate until the whole weighs 1200 parts. It is employed as a gargle, 3 parts to make 20 parts of a stringent gargle.

Utilization of Residue in making Tincture of Myrrh. Mr. E. B. Shuttleworth, the editor of the *Canadian Pharmaceutical Journal*, having noticed the large amount of residue in making tincture of myrrh according to the British Pharmacopœia, was induced to attempt to utilize it. From fifty-two pounds of the residue of percolation, dissolved in boiling water, strained, and allowed to deposit, he obtained twelve gallons of mucilage, forming an ex-

to substitute for paste, and possessing unlimited keeping qualities. Although scarcely so adhesive as mucilage of gum, this latter property may be obtained by the addition of a molasses.

alteration of Lard. G. B. Shuttleworth. (*Canad. Pharm.*

.) The author, having purchased some beautifully white lard, it to contain a large proportion of lime. Mr. Shuttleworth afterwards told by a lard renderer, that it was a common practice among lard dealers to mix from 2 to 5 per cent. of milk of lime with the melted lard. A saponaceous compound is thus formed that is only pearly white, but will allow of the stirring in, during cooking, of 25 per cent. of water.

to on the Division of Powders by the Eye. The practice of weighing powders by the eye (instead of by the balance), so often resorted to in dispensing, has been commented upon by the *Medical and Gazette*.

A number of packets of patent medicines having been purchased, the separate powder in the packets was weighed, and from the results it appears, that with a mean weight of 2.06 grains for single powder in a packet of this patent medicine, the weight of the powder taken at random may fall as low as 1.42 grains, or as high as 2.74 grains. It also appears that, with a mean weight of 1.86 grains, the weight of a powder taken out at random may be from 1.49 to 2.78 grains.

Indicated Prunes. (*Chicago Pharmacist*, iv., 31.)

R. Senna Leaves	2 parts.
Boiling Water	16 parts.

Macerate for an hour and strain; add to this infusion,

Prunes (stoned)	82 parts.
Sugar (crushed)	10 parts.

Mix together, with constant stirring, for about ten minutes, and reduce by means of a water-bath, until reduced to a pulpy confection; add to each pound of this confection,

Citric Acid, in fine powder	1 drachm.
Tincture of Ginger	1 fluid ounce. M.

Food of Infants. Dr. C. A. Coudereau expresses himself in opposition to the generally received opinion that the milk of a wet nurse is the best substitute for that of the mother when the mother's milk cannot be obtained. He has found in the milk of many wet nurses, dependent on their want of cleanliness, a peculiar fungus,

which will develop under favourable circumstances in every other kind of milk, giving to such milk a peculiar odour, and discoverable in the evacuations of the child. In regard to artificial food, he rejects also beef-tea as well as Liebig's extract of meat, but recommends a fluid into the composition of which eggs enter largely. He considers that a very nourishing and wholesome kind of drink can be obtained from 8 eggs, white and yolk together, beaten up with about 2 ounces of sugar and enough water to make a pint and a half of fluid. To this he adds a small quantity of lime-water, sulphate of potash, and chloride of sodium. With a fluid so composed he has obtained excellent results.

Baking Powders. ("Notes and Queries," *Pharm. Journ.*):—

I.

R	Sodæ Carb. Exsicc.	8 oz.
	Acid Tart. Exsicc.	6 oz.
	Pulv. Curcumæ	1 oz.
	Magnes. Carb. Levis	2 oz. M.

II.

R	Sodæ Bicarb.	16 oz.
	P. Acid Tart.	14 oz.
	P. Magnes. Carb.	6 oz.
	Farinæ	12 oz. M.

III.

R	P. Sodæ Bicarb.	9 oz.
	P. Acid Tart.	8 oz.
	Rice Flour	10 oz. M. & 1

spoonful to every pound of flour.

IV.

R	Sodæ Bicarb.	1 lb.
	Farinæ	1 lb.
	P. Alum	$\frac{3}{4}$ lb.
	Magnes. Carb.	$\frac{1}{4}$ oz. M.

Culinary Essences. (*Pharm. Journ.*, 3rd series, i., 857.)

Flavour of Almond.—Take of oil of bitter almonds, 1 fl. drms.; alcohol, 95 per cent., 10 fl. oz.; water, 6 fl. oz. Dissolve the oil in the alcohol, and add the water, and filter. This flavour should not be sold without a caution as to its poisonous nature, and directions as to the quantity to be used.

Flavour of Caraway.—Take of caraway seed, bruised, 1 oz. troy; oil of caraway seed, 2 fl. drms.; diluted alcohol, 16 fl. oz. Digest for 8 or 10 days, and filter.

Flavour of Celery.—Take of celery seed, bruised, 4 oz. troy; diluted alcohol, 16 fl. oz. Digest for 8 or 10 days, and filter.

Flavour of Cinnamon.—Take of Ceylon cinnamon, bruised, 2 oz. γ ; oil of cinnamon, $\frac{1}{2}$ fl. drms.; diluted alcohol, 16 fl. oz. Digest 14 days, and filter.

Flavour of Cloves.—Take of cloves, bruised, 1 oz. troy; oil of cloves, 2 fl. drms.; diluted alcohol, 16 fl. oz. Digest for 8 or 10 days, and filter.

Flavour of Ginger.—Take of ginger root, bruised, 2 oz. troy; wild ginger (asarum), bruised, 1 drms.; lemon peel, bruised, 1 oz. troy; diluted alcohol, 16 fl. oz. Macerate for 14 days, and filter.

Flavour of Lemon.—Take of lemon peel (fresh), cut thin, 2 oz. γ ; oil of lemon (fresh), 1 fl. oz.; alcohol, 95 per cent., 12 fl. oz.; water, 4 fl. oz. Digest for 8 or 10 days, and filter.

Flavour of Nutmegs.—Take of nutmegs (grated), 1 oz. troy; oil of nutmegs, 2 fl. drms.; diluted alcohol, 16 fl. oz. Digest for 8 to 10 days, and filter.

Flavour of Orange.—Take of orange peel (fresh), cut thin, 2 oz. γ ; oil of orange (fresh), $\frac{1}{2}$ fl. oz.; alcohol, 95 per cent., 12 fl. oz.; water, 4 fl. oz. Digest for 8 to 10 days, and filter.

Flavour of Rose.—Take of red rose leaves, in coarse powder, $\frac{1}{2}$ oz. γ ; oil of rose, pure, 5 drops; alcohol, 95 per cent., 6 fl. oz.; water, 10 fl. oz. Dissolve the oil in the alcohol, mix with the water, macerate the rose leaves for 8 to 10 days in the menstruum, and filter.

Flavour of Tonqua Bean.—Take of tonqua bean, bruised, 4 oz. γ ; orris root, in powder, $\frac{1}{2}$ oz. troy; diluted alcohol, 16 fl. oz. Digest for 14 days, and filter.

Flavour of Vanilla.—Take of vanilla bean, cut very small, 2 oz. γ ; diluted alcohol, 16 fl. oz. Digest for 3 to 4 weeks, and filter.

Flavours of banana, pineapple, raspberry, and strawberry, termed *essences*, are alcoholic solutions of the amyl and ethyl ether esters.

Flavour of Pineapple.—Take of essence of pineapple (artificial), 6 fl. drms.; diluted alcohol, 14 fl. oz.; simple syrup, 1 fl. oz.; tincture of cinnamon, 2 fl. drms. Mix.

Flavour of Raspberry.—Take of essence of raspberry (artificial), 1 fl. oz.; diluted alcohol, 12 fl. oz.; syrup of raspberry (fruit), 2 fl. oz.; tincture of orris root (4 oz. to the pint); tincture of cochineal, of each, $\frac{1}{2}$ fl. oz. Mix.

Flavour of Strawberry.—Take of essence of strawberry (artificial), 1 fl. oz.; diluted alcohol, 13 fl. oz.; syrup of raspberry (fruit), 2 fl. oz.; syrup of pineapple (fruit), of each, 6 fl. drms.; tincture of cochineal, of each, 1 fl. oz. Mix.

Pineapple Essence. Chloroform, 1 part (by volume); aldehyde, 1 part; butyrate of ethyl, 5 parts; butyrate of amyl, 10 parts; glycerine, 3 parts; alcohol, 100 parts.

Raspberry Essence. Nitric ether, 1 part; aldehyde, 1 part; acetate of ethyl, 5 parts; formiate of ethyl, 1 part; butyrate of ethyl, 1 part; benzoate of ethyl, 1 part; enanthylate of ethyl, 1 part; sebacic ether, 1 part; salicylate of methyl, 1 part; acetate of amyl, 1 part; butyrate of amyl, 1 part; tartaric acid, 5 parts; succinic acid, 1 part; glycerine, 4 parts; alcohol, 100 parts.

Strawberry Essence. Nitric ether, 1 part; acetate of ethyl, 5 parts; formiate of ethyl, 1 part; butyrate of ethyl, 5 parts; salicylate of methyl, 1 part; acetate of amyl, 3 parts; butyrate of amyl, 2 parts; glycerine, 2 parts; alcohol, 100 parts.

Vanilla Flavour. A correspondent of the *New York Druggists' Circular*, says that, having tried various methods of extracting all the virtue of the vanilla, he has found none to answer so well as the following:—

Take vanilla beans, 1 oz.; white sugar, 1 oz. Triturate in an iron mortar until reduced to a pulpy mass, then pack in a conical glass percolator, and pour on it 8 oz. of neutral sweet spirits, heated by a water-bath in a lightly stoppered bottle to the temperature of 125° F. When this has passed, change the receptacle, and repeat the process with the same quantity of sweet spirits; lastly, mix the percolates.

Sauces. The following formulæ are from the *New York Druggists' Circular*:—

I. White vinegar, 15 gallons; walnut catsup, 10 gallons; Madeira wine, 5 gallons; mushroom catsup, 10 gallons; table salt, 25 pounds; Canton soy, 4 gallons; powdered capsicum, 2 pounds; allspice, powdered, coriander, powdered, $\bar{a}\bar{a}$ 1 pound; cloves, mace, cinnamon, $\bar{a}\bar{a}$ $\frac{1}{2}$ pound; assafoetida, $\frac{1}{2}$ pound, dissolved in brandy, 1 gallon.

20 pounds of hogs' liver is boiled for 12 hours with 10 gallons of water, renewing the water from time to time. Take out the liver, chop it, mix with water, and work it through a sieve; mix with the sauce.

II. White vinegar, 240 gallons; Canton soy, 36 gallons; sugar-house syrup, 30 gallons; walnut catsup, 50 gallons; mushroom catsup, 50 gallons; table salt, 120 pounds; powdered capsicum, 15 pounds; allspice, coriander, of each, 7 pounds; cloves, mace, cinnamon, of each, 4 pounds; assafoetida, 2 $\frac{1}{2}$ pounds, dissolved in St. Croix rum, 1 gallon.

I. White vinegar, 1 gallon; Canton soy, molasses, of each, 1 ; walnut catsup, 1½ pint; table salt, 4 ounces; powderedicum, allspice, of each, 1 ounce; coriander, ½ ounce; cloves, ½ of each, ½ ounce; cinnamon, 6 drachms; assafœtida, ½ ounce, ounces rum. M.

New Insect Poison. (*Pharm. Journal*, 3rd series, i., 6.) M. considers the following to be a complete annihilator for lice and other small insects:—Take 3½ ounces of quassia, and 5 drachms of stavesacre seed powdered; these are to be into 7 pints of water, and boiled until reduced to 5 pints. When the liquid is cooled, strain it, and use with a water-pot or syringe.

Wright's Hair Dye. (*Pharm. Journ.*, 3rd series, i., 170.) Scald tea, two ounces, in one gallon of boiling water; strain, and add three ounces of glycerine; tincture of Spanish flies, half an ounce; and bay rum, one quart; digest the mixture for two or three days, and perfume with essence of rose or bergamot, or any other suitable essence to suit the taste.

Hair Washes.

I.

R Sp. Ammon. Arom., Tinct. Canthar., Glycerine, aa ʒss.
Aq. Rosæ ad ʒvj.

II.

R Pulv. Sodæ Bibor. ʒi.
Potass. Carb. ʒi.
Tr. Lyttæ ʒiij.
Sp. Rosmarini ʒi.
Aq. Camph. ʒvj.
Aq. Rosæ ad. ʒxx. M.

Mix with essence of bitter almonds and filter.

Lemon-Juice and Glycerine. (*Pharm. Journ.*, 3rd series, i., 658, 1875)

I.

R White Wax ʒss.
Oil of Sweet Almonds ʒviij.

Emulsify by heat of a water-bath, and add gradually, S. A.,

Glycerine ʒi.
Lime or Lemon-juice, or
Citric Acid, gr. xxxij., and Water } ʒi.
Rectified Spirit of Wine ʒss.
Water ʒij.
Ess. Lemons ʒij.
Essential Oil of Almonds gtt. v.

II.

R	Ol. Amygdalæ	3ss.
	Ol. Ricini	3ij.
	Liq. Calcis	3iiss.
	Otto Rosæ	q. s.

III.

R	Ceræ Alb., Cetacei,	ana. 3ij.
	Ol. Amygd.	3viij.
	Succ. Limellæ	3vj.
	Glycer. Boracis	3ij.
	Ess. Limon.	3ss.
	Ess. Bergam.	3ij.

Melt the wax and spermaceti, add the oil and perfume, then shake till cold with the lime-juice and glycerine previously warmed.

Colouring for Pomades. (*Pharm. Journ.*, 3rd series, i., 377.)

B. T. M. recommends the addition of a small quantity of powdered gamboge. He finds it a nice colouring ingredient, and unaffected by exposure to light.

Amandine. (*Pharm. Journ.*, 3rd series, i., 598, 637.)

I.

Take of Fine Pale Honey (or strong Syrup) . .	4 oz.
White Soft Soap, made from Lard and Potash .	2 oz.

Mix them thoroughly in a wedgwood mortar, adding, if necessary, two or three teaspoonfuls of solution of potash, so as to produce a thoroughly homogeneous paste. To this add and rub in by degrees and very gradually,—

Oil of Almonds	3½ lbs.
Essential Oil of Almonds, Essence of	
Bergamot	aa 3 drms.
Oil of Cloves, Balsam of Peru	aa 1½ drms.

previously mixed, and continue the trituration until the whole assumes the appearance of a rich transparent jelly. Finally, put the paste into pots or wide-mouthed bottles.

Note.—The balsam ought to be triturated with a little of the almond oil, warm, before adding it to the rest, and after all the scents are added, the oil should be allowed to settle for two or three days and the clear portion only used.

In using, a lump of amandine the size of a large pea is rubbed with a few drops of warm water, and the rich white lather applied to the hands, face, neck, etc. In a short time the skin may be wiped with a soft napkin.

Amandine may be *glycerated* by adding one ounce of the best glycerine for every pound of oil to be used.

II.

℞ Ol. Amygdal. Dulc.	lb. iij.
Syrup. Simplicis	3ij.
Sapon. Mollis Alb.	3ss.
Ol. Lavand. Ang., Ol. Bergam. Opt.	ss 3ss.
„ Caryoph.	3ij.

ub the syrup and soap together in a perfectly clean mortar until mixture is homogeneous. Mix the perfume with the oil, and add *gradually, stirring briskly* until thoroughly incorporated.

III.

℞ Mel. Ang. Opt.	3ij.
Ovi Vitell.	No. ij.
Pulv. Iridis.	3ss.
Ol. Amygdal. Dulc.	3iv.
Otto Rosæ	gtt. xij.

x the first three ingredients until they are a perfectly smooth , and add the oil (first mixed with the otto) slowly until the is combined.

rocerine Jelly. (*Pharm. Journ.*, 3rd series, i., 397)

℞ White Soft Soap	4 oz.
Pure Glycerine	6 oz.
Almond Oil	3 lbs. in summer, 4 lbs. in winter.
Otto of Thyme	2 drachms.

he soap and glycerine in a mortar, add the perfume to the oil, ub it in gradually, taking care not to add the oil faster than it e incorporated, or the result will not have the jelly-like appear- required.

k of Roses. (*New York Druggists' Circular*, and *Pharm. Journ.*, 3.) In making milk of roses, the chief object should be to ce a perfect emulsion, or one at least which, if it separates long repose, may be restored to a homogeneous state by slight ion. Although other perfumes may be and are commonly . to it, the scent of roses should predominate and form its teristic odour.

English Milk of Roses.

I.

℞ Almonds (blanched)	1½ ounce.
Oil of Almonds, White Windsor Soap	āā 1 drachm.
Rose-water	½ pint.

ke an emulsion; to the strained emulsion, add a mixture of—

Essence or Spirit of Roses	½ fl. drachm.
Alcohol	2½ fl. ounces.

and, subsequently, sufficient rose-water to make the whole measure one pint. More alcohol is often ordered and used; but much of it is apt to cause the separation of the ingredients. In many samples and in the inferior ones generally, it is omitted altogether. Some makers add a few drops of oil of bergamot, with two or three drops each of oil of lavender and otto of roses, dissolved in the alcohol.

II.

℞ Oil of Almonds, White Windsor Soap . . .	āā 1 ounce.
Salts of Tartar	½ drachm.
Boiling Water	½ pint.

Triturate and subsequently agitate until perfectly united. When cold, further add—

Alcohol	2 fl. ounces.
Spirit of Roses	a few drops.
Rose-water	q. s.

to make the whole measure a pint.

The above are used as cosmetic washes in a similar way. "Gowland's Lotion," also to remove scurf, freckles, and acne, other pimples, and eruptions in slight cases.

French Milk of Roses.

I.

℞ Tincture of Benzoin	(simple) ½ fl. ounce.
" " Styraç	½ fl. ounce.
Spirit of Rose	1 to 2 fl. drachms.
Alcohol	2½ fl. ounces.

Mix, and add gradually, with agitation, rose-water 16½ oz.

Augustin recommends the addition of a little carbonate of potash (say 1 dr. to the pint) when it is intended to be used as a lotion for acne.

II.

℞ Tincture of Benzoin (simple)	1 fl. drachm.
" " Balsam of Peru	20 drops.
Rose-water	½ pint.

The addition of an ounce of alcohol, in lieu of a like quantity of rose-water, improves it.

III.

℞ Almond Paste	8 drachms.
Rose-water	½ pint.
Tincture of Benzoin	½ fl. ounce.

and make an emulsion as before. Use, etc., same as the preceding.

German Milk of Roses.

R Dilute Solution of Diacetate of Lead	‡ fl. ounce.
Lavender-water	2 fl. drachms.
Alcohol	2‡ fl. ounces.
Rose-water	‡ pint.

Mix, with agitation. The alcohol is often improperly omitted, or less is used. It is cooling and astringent, and is employed as a wash, like the preceding; also in most eruptions, excoriations, etc., but it is more active and less fitted for very frequent use.

Toilet Vinegar.

R Ol. Neroli, Ol. Cloves, Ol. Lemon, Ol. Bergamot, Ol. Cedrat.	āā ʒj.
Otto Rosæ	gtt. xx.
Gum Benzoin	ʒv.
Balsam Tolu	ʒj.
S. V. R.	Oiiij.

Digest for six days and add—

Acid. Acet. Glacial.	ʒiiss.
Ess. Ambergris	gtt. x.
„ Musk	gtt. x.

After twenty-four hours, add aq. destill. ʒx., and filter.

Florida Water. (*Pharm. Journ.*, 3rd series, i., 598.)

R Ol. Lavandulæ, Ol. Bergamot, Ol. Limonis āā 2 drachms.	
Tincturæ Curcumæ, Ol. Neroli	āā 1 „
Ol. Mellissæ	80 drops.
Ol. Rosæ	10 „
Alcohol	2 pints.

Essence of Moss Rose. (*Pharm. Journ.*)

R Otto Rosæ	ʒiiss.
Ess. Ambergris	ʒiiss.
Ess. Moschi	ʒj.
Sp. Vini. Rect.	ʒxv.
Aq. Rosæ Conc.	ʒx.

Eau de Millefleurs.

R Essence of Violets	lb. j.
„ of Jasmine	ʒj.
„ Bergamot	gtt. xx.
Otto of Rose	gtt. x.

Pot Pourri. (*Pharm. Journ.*, 3rd series, i., 496, 515.)

I.

R Gum Benzoin	ʒij.
Cloves	ʒj.
Styrax Cal.	ʒss.
Cort. Cinnam.	ʒij.
Rad. Iridis	ʒj.

Roughly powdered together ; then add—

Musk.	3ss.	
Bay Salt.	℥ij.	
Ol. Lavand.	gtt. xx.	Mix.

II.

R. Lavender Flowers	1 lb.	
Yellow Sandal-wood	4 lbs.	
Cloves	2 lbs.	
Nutmegs	2 lbs.	
Orange Peel	2 lbs.	
Lemon Peel	2 lbs.	
Cumin Seeds	1 lb.	
Cinnamon	2 lbs.	
Juniper Berries	2 lbs.	
Rose Leaves	2 lbs.	
Musk	℥j.	

III.

R. P. Cinnamon, P. Cloves, P. Mace	āā ʒiv.	
P. Orris	ʒiv.	
Ess. Lemon, Ess. Verbena, Ess. Bergamot, Ol.		
Lavand.	āā ʒxl.	Mix.

IV.

R. Baccæ Pimentæ, coarsely powdered.	ʒij.	
P. Cinnamon	ʒij.	
Ol. Lavand., Ess. Amberggris, Ess. Moschi	āā gtt. xij.	M.

V.

R. Rad. Iridis Pulv.	lb. j.	
Rad. Calam. Arom., G. Benzoes, Bay Salt, G.		
Storax	āā ʒiv.	
Caryophylli	ʒj.	
Mace.	ʒss.	
Mosch. Gran.	gr. viij.	
Ras. Santal Flav.	ʒij.	
Florum Lavand.	lb. ij.	M. S. A.

Pastile Paper. (*Pharm. Journ.*, 3rd series, i., 497.)

R. Olibanum	ʒxviij.	
Styrax	ʒviij.	
Benzoin	ʒvj.	
Peruvian Balsam	ʒiv.	
Tolu Balsam	ʒiij.	
S. V. R.	ʒx.	

Macerate for twenty-eight days, with occasional agitation, and add—

Saturated Solution Potassium Nitrate	ʒj.	
--	-----	--

Soak the paper in it, and dry.

Furniture Cream.

R. Cera Flav.	2½ oz.	
„ Alb.	1 oz.	
Sapo. Cast.	ʒj.	
Ol. Terebinth., Aq. Bull.	āā 10 ozs.	
Potass. Carb.	ʒj.	

the wax and turpentine together, dissolve the soap and potassium carbonate in the aqua, and mix while warm, stirring till cold.

Wax Varnish for Waxed Paper, etc. H. Koch. (*Amer. n. Pharm.*, xlii., 563.) The author states that bisulphide of carbon readily produces a concentrated clear solution of wax, even without the aid of heat, and evaporates so quickly that wax paper used by its aid is ready for use within a few minutes after being impregnated.

This solution will also be found especially adapted for coating gum statuettes and other similar work; it may also be used for closing up small cracks in furniture prior to varnishing or painting.

Black Lustre Colour for Sugar-paper. Dr. Kiemeier. (*Dingl. Journ.*, cxcix. 233, and *Journ. Chem. Soc.*, ix., 170, 1871.) Ordinary glue, 16 lbs. water, 1 lb. potato starch, $5\frac{1}{2}$ lbs. water, 1 lb. Campechy extract of 6° Baumé, 1 lb. 2 oz. green vitriol, 1 lb. brown glycerine; all boiled together, and stirred when cold. Paper once painted with this mixture acquires, when dry, a fine black surface, remains supple, and does not exhibit a tendency to get sticky. If it be desired to render the paint thicker on the inner, the starch and the glue must be increased or diminished in the same proportion, or the lustre will be spoiled.

Recipe for Cleaning Kid Gloves. (*New York Druggists' Circular.*)

R. White Soap	250 parts.
Water	155 „

Mix with heat, cool, and add—

Eau de Javelle	165 parts.
Solution of Ammonia	10 „

The whole to be ground together until a smooth paste is formed. The paste of this is rubbed over the glove with a piece of flannel.

Preparations for India-rubber.

I.

R. India Rubber	1 drachm.
Gutta Percha	4 „
Bisulphide of Carbon	4 oz. M.

II.

R. Bisulphide of Carbon	4 oz.
India-rubber	1 oz.
Isinglass	2 drachms.
Gutta Percha	1½ oz. M.

III.

A solution of shellac in ammonia has also been recommended.

Powdered gum shellac is macerated in ten times its weight of strong ammonia, when a slimy mass is obtained, which in three or four weeks becomes liquid.

Liquid Cement. For cementing glass, crockery, wood, etc., the following compound is recommended:—Six parts of glue, in small pieces, are macerated for several hours in sixteen parts of water; one part of hydrochloric acid, and one part and a half of sulphate of zinc are then added, and the mixture is exposed for ten or twelve hours, to a temperature of 68° or 70° C.

Waterproofing. (*Pharm. Journ.*, 3rd series, i., 799.)

R	Bisulph. Carbon.	3ij.
	Gutta Percha	3ss.
	G. Asphalt.	3ij.
	(Brown Amber)	3ss.
	Ol. Lini	3xij. Misc.

Dissolve the gutta percha in the bisulph. carbon., the asphalt and amber in the oil, and mix well.

Drying Oil. (*Chem. News*, xxii., 204.) Mix old linseed oil, the older the better, with two per cent. of its weight of manganese borate, and heat this mixture on a water-bath, or in the case of large quantities, by a steam-bath, to 100° or at most 110°, keeping the mixture well stirred. A very excellent, light-coloured, rapidly-drying oil is thus obtained. The borate of manganese is readily prepared by precipitating a solution of sulphate of manganese with a solution of borax. The precipitate is collected, washed, and dried at 100°.

The rapidity of the drying of the oil after it has been mixed with paint and spread over a surface, does not simply depend on the drying property of the oil, but in a very great measure on the state of the atmosphere, the action of sunlight, etc.

Bleaching Sponges. (*Pharmacist*, iv., 20.) Sponges can be bleached by first soaking them in hydrochloric acid, diluted with 1½ parts water, until no more carbonic acid is given off; then wash in pure water, and afterwards leave in a bath composed of 2lb. hyposulphite of soda, 12 lbs. water, and 2 lbs. hydrochloric acid. If the sponge be afterwards dipped in glycerine and well pressed, to remove excess of liquid, it remains elastic, and can be used for mattresses, cushions, and general upholstery. Sponge mattresses prepared in this way are now finding great favour. It is, of course, not necessary to bleach the sponge where it is intended to be used for such purposes.

Indelible Ink. (*Deutsche Industriezeitung.*) The following recipe

ren by Puscher:—Dissolve 4 parts of anilin black in 16 parts weight of alcohol, with 60 drops strong hydrochloric acid, dilute the dark blue solution with 90 parts by weight of water, hich 6 parts of gum arabic have been previously dissolved. ink is said not to act upon steel pens or to suffer any alteration kalies or acids.

ceeing and Ventilating Machine. (*British and Medical al*, 1870, ii., 220.) In the construction of this machine, ted by Franz Mulhausen, Esq., the cold is produced by the anical expansion of atmospheric air. It produces, when in ope- 1, any desired degree of cold, freezes water without the use of chemical agents, and will effectually cool and ventilate any ment or building, on whatever scale, large or small. The r of one man, with a small five-horse motor-power machine, roduce 100 pounds of ice an hour, and cool 15,000 cubic feet from thirty to fifty degrees below Réaumur.

thod of Rendering Wooden Taps Impervious for Liquids and mting their Cracking. Dr. E. Kopp. (*Chemical News*, vol. , p. 45, 1871.)

e taps are placed in molten paraffin, heated to from 110° to by this means the water is eliminated from the wood, and the becomes thoroughly impregnated with paraffin. The taps are d in this bath until all the aqueous vapour has been expelled are left in, after the removal of the vessel from the fire, up to ery moment the paraffin begins to solidify. Wooden taps thus red are very durable, do not become soaked with liquids, keep tight, and are not liable to become mouldy. The excess of in is wiped off with care, and the taps are next rubbed clean a piece of flannel.

thod of Tinning Copper, Brass, and Iron in the Cold and ut Apparatus. F. Stolba. (*The Pharmacist*, iv., 86.) requisites for accomplishing this object are—1st. The object coated with tin must be entirely free from oxide. It must refully cleaned, and care be taken that no grease spots are it makes no difference whether the object be cleaned mechani- or chemically. 2nd. Zinc powder; the best is that prepared ially by melting zinc and pouring it into an iron mortar. It e easily pulverised immediately after solidification; it should out as fine as writing sand. 3rd. A solution of proto- de of tin containing 5 to 10 per cent., to which as much rised cream of tartar must be added as will go on the point of e. The object to be tinned is moistened with the tin solution,

after which it is rubbed hard with the zinc powder. The *tinning* appears at once. The tin-salt is decomposed by the zinc, *metallic* tin being deposited. When the object tinned is polished *brass or* copper, it appears as beautiful as if silvered, and retains its *lustre* for a long time. The author uses this method in his laboratory to preserve his iron, steel, and copper apparatus from rust. *This* method would become of great importance if the tinning could be made as thick as in the dry way, but this has not as yet been accomplished.

BIBLIOGRAPHY.



PART V.

BIBLIOGRAPHY.

First Principles of Chemical Philosophy. By JOSIAH P. COOKE,
Erving Professor of Chemistry and Mineralogy in Harvard
College. London and Cambridge: Macmillan & Co. 1870.

This book deals solely with the theories of the science. It is assumed that the student who enters upon its perusal has already become familiarised, by practical work in the laboratory, with the appearance and chemical and physical characteristics of at least the majority of the most interesting of the elements and their compounds. He should also have a general acquaintance with the methods of qualitative analysis, and of the processes by which the ponderal relations of chemical bodies have been determined. There must therefore be two classes of persons who would be interested in such a treatise; in the first place, those students who have spent, say, a twelve-month in experimental work, and are desirous of seeing a little more of the regions of theory to which their experiments must ultimately lead them; and also a class, probably pretty numerous, of those who, their student days long since gone by, are anxious to renew their acquaintance with scientific literature, but find that times are changed, and that it is impossible to read chemical memoirs of to-day with the notions of twenty, or even of ten years ago.

The advances that have been made in chemical theory may be briefly summarized under two heads.

In the first place, an Atomic Theory of one kind or other seems to have become, if possible, more firmly established in the minds of chemists; but the definitions of atoms and molecular ultimates, or molecules, have gradually acquired a more precise signification than formerly.

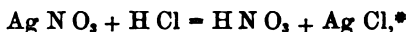
Thus, atoms, whatever they may be, are, according to modern ideas, generally incapable of subsisting in a state of isolation. There are two or three elements whose atomic and molecular weights are believed to coincide; but this does not interfere with

the general statement that an atom, considered from the chemist's point of view, is the smallest quantity of a body which can exist in a molecule, or can be transferred from one compound to another in a chemical reaction.

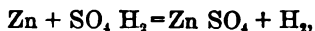
A molecule, on the other hand, is an aggregate of atoms, and is regarded as the smallest particle of any substance, whether a compound or an element, as usually defined, which can exist by itself. Thus, H_2 , O_2 , Cl_2 , N_2 , Na_2 , K_2 , Hg , As_4 , HCl , H_2O , H_2N , H_2C , are the symbols of molecules. The quantities by weight represented by the foregoing symbols, are comparable with each other upon the same scale, for they occupy, when in the state of vapour, precisely the same measure or volume. Hence the molecular weights of different substances are proportional to the specific gravities of their vapours. And this constitutes one of the most important standards we can apply in the measurement of molecular magnitudes. The system employed by nearly all chemists at the present day, is a two-volume system; that is to say, the molecular weight of a body is taken to be that quantity which, in the state of gas or vapour, occupies twice the volume of *one part by weight of hydrogen*.

The second great feature of modern chemistry is the prominence that is accorded to the theory of atomicity, and the profound modification of all ideas of the constitution of chemical compounds which has necessarily followed thereupon. The phenomena of equivalency and of quantivalence, as well as the theory of atomicity, are intelligibly treated of by Professor Cooke; and it is satisfactory to find that he has plainly marked that distinction between the two ideas which so many even professed chemists fail to perceive. "If in a solution of argentic sulphate we place a strip of metallic copper, we find after a short time that all the silver has separated from the solution, and that a certain quantity of copper has dissolved in its place. If now we pour off the solution of cupric sulphate, and place in this solution a strip of metallic zinc, the metallic copper in its turn will separate, and, to replace it, a certain quantity of zinc will dissolve. Lastly, if we pour off the solution of zinc sulphate, and place in this a strip of metallic magnesium, the zinc will, in like manner, be replaced by magnesium. In experiments like these, we can, by proper analytical methods, determine the relative quantities by weight of the several metals which thus replace each other; and we find that they are always the same. It would appear, then, that these relative quantities of the several metals exactly replace each other in all such cases. They are therefore regarded as the chemical equivalents of each other, in the sense that they are

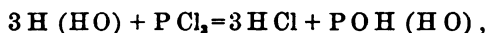
able of filling each other's place." These quantities, expressed in numbers, are in some cases identical with the atomic weights which have been determined by other experiments and considerations; but in the great majority of cases, the equivalents are some fraction, as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, etc., of the atomic numbers. Hence, whilst any of the elementary atoms are equivalent each to each, it happens frequently that one atom of one element is the equivalent of two, three, or four atoms of another element. Thus, "the action of aqueous hydrochloric acid on a solution of argentic nitrate is expressed by the equation,



and here evidently Ag exchanges places with H; and hence, 1 atom of silver is equivalent to 1 atom of hydrogen. Take now the action of dilute sulphuric acid on zinc, which is expressed by the equation,



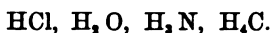
and it will be seen that Zn has changed places with H₂, and hence that one atom of zinc is the equivalent of two atoms of hydrogen. Lastly, in the reaction of water on phosphorus trichloride, expressed by the equation,



it is equally evident that P has changed places with H₃, and hence, in this reaction, one atom of phosphorus is equivalent to three atoms of hydrogen. This relation of the elements to each other is called by Hofmann quantivalence; and selecting here, as in the system of atomic weights, the hydrogen atom as our standard of reference, the atoms of different elements are called univalent, bivalent, trivalent, or quadrivalent, according as they are, in the sense already indicated, equivalent to one, two, three, or four atoms of hydrogen. The quantivalence of an element or radical is shown, not only by its power of replacing hydrogen atoms, but also by its power of replacing any other atoms whose quantivalence is known.

Moreover, what is still more important, the quantivalence of an element or radical is shown, not only by its replacing power, but also by what we may term its *atom-fixing* power; that is, by its power of holding together other elements or radicals in a molecule. As examples, the molecules of hydrochloric acid, water, ammonia, and marsh-gas—

* The notation here employed is slightly altered from the original, which seems to the writer to be objectionable.

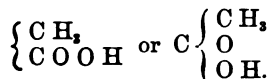


The atoms of chlorine, oxygen, nitrogen, and carbon are accordingly uni-, bi-, tri-, and quadri- valent respectively.

"The quantivalence of the chemical elements especially, as indicated by their atom-fixing power, is by no means always the same. They constantly exhibit, under different conditions, an unequal atom-fixing power. Thus we have Sn Cl_2 , and Sn Cl_4 , P Cl_3 , and P Cl_5 , N H_3 , and $\text{N H}_4\text{Cl}$. Each element, however, has a maximum power, which it never exceeds. This we shall call its atomicity, and we shall distinguish the elements as monads, dyads, triads, etc., according to the number of univalent atoms or radicals they are able at most to bind together."

"When, in the molecule of any compound, the dominant or central atom is united to as many other atoms as it can hold of that kind, the molecule is said to be saturated. If, now, from a saturated molecule we withdraw one or more atoms of hydrogen or their equivalents, the residue may be regarded as a compound radical with an atomicity equal to the number of hydrogen atoms, or their equivalents, withdrawn. Thus, if from the saturated molecule of marsh-gas, H_4C , we withdraw one atom of hydrogen, we get the radical methyl H_3C , which is a monad; if we withdraw two atoms, we have the radical H_2C , which is a dyad; if we withdraw three, there results HC , which is a triad; and lastly, if we withdraw all four, we fall back on the tetrad atom of carbon."

Acting upon considerations of this kind, all compounds are represented as built up of various radicals, which in their turn are composed of atoms; and it is found that in order that the atomicity of each constituent of the molecule may be satisfied, a notation must be employed which represents certain atoms in union with each other but only connected with the remaining atoms in a manner more or less indirect: one example will suffice. Acetic acid must be expressed by the formula $\text{C. C H}_3. \text{O. O H.}$, which may be written in a variety of ways, as thus:—



They all, however, show the same thing, namely, that in this body we have an atom of tetrad carbon united with one atom of monad methyl, C H_3 , with one atom of dyad oxygen, O , and with one atom of monad hydroxyl.

It must be admitted, however, that although these formulæ exhibit

parts into which the molecule may be broken up, or from which it may be formed, they take no cognisance of the undoubted fact, that the different constituents have a certain influence on each other which tends to maintain equilibrium in the molecule, and which is essential to its existence as such.

The particular form of notation made use of by Professor Cooke, probably been adopted for the sake of convenience in printing tables; otherwise there is but little to be said in its favour.

In the second part, which is devoted to a description of the elements and their chief compounds, all the most recent observations receive due notice. Thus, Roscoe's researches on Vanadium are presented by two pages; Marignac's conclusions respecting the constitution of Columbium and Tantalum compounds are adopted and explained; the most important of the silicic ethers are tabulated. On the other hand, Rubidium, Cæsium, and Thallium are alluded to much too briefly; Antozone is described as a definite substance, whereas all that is known of it, and the very characters ascribed to it on these pages, point to the fact that it is merely peroxide of nitrogen; and one of the most instructive possible instances of isomerism,—the isomeric cyanides and cyanates,—is unnoticed.

Notwithstanding, however, these few defects and omissions, this is a very capital book, and is well worthy of careful perusal. Students should work out the exercises which supplement each chapter.

Course Notes for Chemical Students. By EDWARD FRANKLAND, F.R.S., Professor of Chemistry in the Royal School of Mines. Vol. i., *Inorganic Chemistry.* Van Voorst.

The chief object of this small volume, as explained in the preface, is to relieve the student of the task of making very copious notes in the lecture theatre, and so to allow him to concentrate his attention on the arguments and explanations of the speaker.

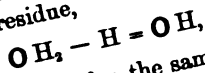
It furnishes a sort of synopsis, in the first place of the laws of chemical action, then of the principles of chemical nomenclature and notation. But the greater part of the book is occupied with formulæ and reactions, expressed in symbols, of the more important elements and their compounds. The description of the properties of the bodies treated of is almost entirely omitted; but all the reactions which serve to establish the relationship between the several members of any series of bodies are brought into sufficient prominence.

It is needless to say that the notation employed is that which has

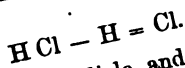
YEAR-BOOK OF PHARMACY.

been introduced by Professor Frankland himself. As in ordinary chemical notation, every element is represented by a symbol, generally the initial letter of the name, and this symbol denotes a certain definite proportion by weight—the atomic weight of the element. As usual, also, the symbols of compounds are formed by the simple juxtaposition of the symbols of their constituent elements; thus, argentic chloride— Ag Cl .

But the peculiarities of the notation are, first, that all the formulæ employed are “constitutional” formulæ; that is to say, they aim at expressing, not only the constituents and the proportions of the same in a chemical compound, but the order in which the atoms are linked one to the other; and, secondly, since the notation is based upon the theory of the atomicity of the elements, there is in each formula one symbol distinguished by thick type, which is intended to signalise it as the centre or nucleus of grouping. It is the symbol of that element which, of all those entering into the construction of the molecule, possesses the greatest number of units of combining capacity or atomicity. An example or two will make this clear. The ordinary formula of water would be H_2O or O H_2 . In notation described it is written, O H_2 , which is intended to indicate that the two atoms of hydrogen are not directly connected with each other, but that both are united to the oxygen, which, in consequence of its diatomic character, is capable of holding them both. Similar reasons canstic potash is O K H . Since a certain number of groups of atoms, acting the part of radicals, occur very frequently, Dr. Frankland finds it convenient to represent them in a particular manner. Thus, if from a molecule of water, an atom of hydrogen is removed, we obtain a residue,



which is of course monatomic for the same reason that hydrochloric acid an atom of H is removed, we get the residue or radicle Cl ,



To indicate the character of radicle, and for convenience in formulæ, the residue of water is written H_2O . In other common radicals receive similar treatment, it becomes no in all but the very simplest compounds, it becomes no a plan of exhibiting the order in which the radicles enter. This is done by means of the bracket. The example already made use of, the residue of water, two such radicles united together may often be

generally thus: $\begin{Bmatrix} \text{O H} \\ \text{O H} \end{Bmatrix}$.

This compound is peroxide of hydrogen. This formula shows the two atoms of oxygen are tied together, but that the atoms of hydrogen are only united with their respective atoms of oxygen, and are otherwise independent of each other. Similarly the following:—

$\begin{Bmatrix} \text{O H} \\ \text{H} \end{Bmatrix}$	$\begin{Bmatrix} \text{O H} \\ \text{O H} \end{Bmatrix}$	$\begin{Bmatrix} \text{O H} \\ \text{Cl} \end{Bmatrix}$	$\begin{Bmatrix} \text{O Cl} \\ \text{Cl} \end{Bmatrix}$	$\begin{Bmatrix} \text{O Cl} \\ \text{O H} \end{Bmatrix}$
Water.	Hydric peroxide.	Hypochlorous Acid.	Hypochlorous [Anhydride.	Chlorous Acid.
Hypophosphorous acid				P O H, Ho
Phosphorous acid				P O H Ho,
Phosphoric acid				P O Ho,
Marsh-gas				C H,
Chloride of methyl.				C H, Cl.
Chloroform				C H Cl,
Methylic alcohol				C H, Ho.
Methylic ether				$\begin{Bmatrix} \text{C H,} \\ \text{O} \\ \text{C H} \end{Bmatrix}$
Common alcohol				$\begin{Bmatrix} \text{C H,} \\ \text{C H, Ho} \end{Bmatrix}$
Acetic acid				$\begin{Bmatrix} \text{C H,} \\ \text{C O Ho.} \end{Bmatrix}$

The arrangement of the book, and the order in which the elements are studied, is in accordance with their atomicity; but this classification is presented in a judiciously modified form. The elements are arranged as monads, dyads, etc., according to the number of atoms of hydrogen which their atoms are respectively capable of representing; but the monads, for example, are divided into four classes or sections. The first contains hydrogen only. Even though everybody quite believes in the thoroughly metallic character of hydrogen, it is still necessary, considering its physical properties and small atomic weight, to set it apart from the solid metals, potassium, sodium, and silver. The second section of monads includes fluorine, chlorine, bromine, and iodine. The third comprises cesium, rubidium, potassium, sodium, and lithium. The fourth, thallium and silver; and so on through six groups, up to the metals. One of the strange results of this sort of arrangement, however, is, that we have to look for lead,—which is as closely related to thallium as any of the alkaline group,—in the fourth column

among the tetrads. Oxygen is, in like manner, dissociated from kindred sulphur, aluminium from chromium and iron, copper silver, zinc from cadmium. But, of course, all those questions will be fully discussed in the lectures, of which these notes are but skeleton. Such objections are, moreover, applicable to every system of classification which has hitherto been proposed.

The second volume has not yet appeared.

A Laboratory Text Book of Practical Chemistry; or, Introduction to Qualitative Analysis. By WM. G. VALENTIN, F.C.S.
Churchill & Sons, New Burlington Street. 1871.

This excellent laboratory companion is divided into two parts. The first contains a hundred elementary exercises introductory to General Chemistry; the second gives a systematic course of qualitative analysis. The elementary exercises begin with a study of hydrogen; its formation from water, first by the action of sodium, by the action of zinc and an acid; its collection; and, lastly, its physical and other properties. The chapter, which does not quite fill five pages, is illustrated by ten woodcuts. The first shows the method of filling a gas jar with water, and inverting it into the pneumatic trough; the second exhibits the manner of introducing the gas into the inverted jar full of water, so as to collect the hydrogen. Further on we have four illustrations, showing experiments which demonstrate the inflammability of hydrogen, its incapability of supporting combustion, and its lightness.

The second chapter, developed in a similar manner, gives the properties and constitution of oxygen, nitrogen, and atmospheric air; the nature of combustion and oxidation; and the classification of oxides.

From qualitative work of this kind, the student is next introduced to the consideration of combinations between definite proportions of weights. This paves the way for a chapter on the atom, atoms and molecules, and the definitions of atomic and molecular weight. Further on, some pages are devoted to the theory of the quantivalence of atoms, and the classification of the elements according to their atomicity or highest valence. Mr. Valentin, of course, makes exclusive use of the system introduced by Dr. Frankland, and of which we have found in the notice already given of his "Lectures" that the system is essentially the same as that employed by modern chemists, that is to say, it is founded on the r

rence in the combining or replacing power of the different elementary atoms; but a few advantageous modifications of the elementary symbols are adopted. These have already been described. An account of the theory of atomicity will be found in the notice of Berzelius's "Chemical Philosophy."

In the manner, then, which has been explained, the First Part of the book before us introduces the student to the principal non-metallic elements; shows him the nature of chemical reactions and expresses them symbolically. The Second Part gives those reactions of each metal and acid which serve to identify it, either alone or mixed with other bodies. Each section is headed by the names and formulæ of the most common of the minerals containing the element which is to be studied.

There are several features in this Part which render it educationally superior to most other books on the same subject. One especially is the plan adopted at the end of each group of metals of giving certain characters belonging to each, from which the student is requested to draw up for himself a tabular scheme for the separation of the members of the group. This does away, to a considerable extent, with the mechanical character which qualitative practice is so often to assume, and compels the student to make use of his own judgment more frequently, and to be less dependent upon tables supplied at the end of the book.

This "Text Book" of Mr. Valentin's is undoubtedly worthy of the highest praise. Both the arrangement and details of the book are entirely satisfactory; and the desire expressed by the Author to assist his readers to generalize and to systematize, seems to be very successfully carried out. It is to be regretted that all notices of elements are usually called the "rare" elements should have been avoided. Surely we have learnt by this time that lithium, rubidium, cesium, thallium, are sufficiently widely diffused to render the search for them in minerals and mineral waters by no means superfluous. The platinum group of metals has also within the last few years been brought into a position of considerable interest and importance. Selenium and tellurium again, tungsten and molybdenum would also seem to deserve a place in a book which professes to be a guide to the course of practical instruction given at the Royal College of Chemistry.

The system of notation employed appears, too, to be used rather absolutely. A student who sees the symbols of a compound invariably written in the same order, acquires after a time the belief that they must always be written in that order. It is not only an

advantage to vary the mode of writing a formula, so as to exhibit, according to the occasion, the different relations of the body represented; but in the present state of science the employment of any particular form of notation, without any variety of expression, seems, to say the least, a little injudicious.

Introduction to the Study of Inorganic Chemistry. By WILLIAM ALLEN MILLER, M.D., D.C.L. Longmans, Green & Co. 1871.

This little book is one of the best of its class. The usual text-books set before young students of chemistry introduce far too much of technicality into their language and mode of handling the subject at the commencement; a more progressive character has been long desirable. This little introductory treatise, the work of the late much-lamented Professor Miller, thoroughly satisfies these requirements, and it is on this account better suited to the use of those who are altogether destitute of acquaintance with chemical phenomena and chemical laws than perhaps any other at present existing. The opening chapters explain the scope and aim of chemistry, and are illustrated by experiments, for which full directions are supplied, as indeed in every chapter in the book. The following are extracts from the Preface:—"This book is written expressly for beginners. In order that they should really understand the statements which it contains, it will be necessary for them to begin at the beginning and to go straight through it. Among other reasons for adopting this course, it is to be noted that it is impossible to avoid the use of technical terms in discussing a scientific subject; since we often have to deal with matters for which no expressions are in use in ordinary language.

"The student is strongly advised never to omit the performance of any experiment which he has the means of making. No useful knowledge of chemistry can be acquired by any one unless he constantly makes experiments as he proceeds with the study."

In this last remark, all teachers will concur heartily.

In order to indicate the methods adopted, detailed directions for the performance of upwards of two hundred and fifty experiments, for the most part of a simple nature, are dispersed through the book; but, of course, a judicious teacher will suggest many others as his pupils make progress. Chemical formulæ are employed from the commencement of the book; but the less easily intelligible matters connected with the atomic theory, the theory of atomicity, etc., are deferred until, when the student reaches the middle of the

book, he may be supposed to have gained a certain familiarity with a sufficient number of definite chemical compounds to serve as examples or illustrations of the explanations then given.

A future edition of the book will be rendered complete by the addition at the end of each chapter of a series of Questions, to which solutions might with advantage, in some cases be appended.

Chemistry: General, Medical, and Pharmaceutical, including the Chemistry of the U. S. Pharmacopœia. By JOHN ATTFIELD, Ph.D.; F.C.S., etc. Philadelphia: Henry C. Lea. 1871.

Any description of this well-known manual would be superfluous, since this American edition differs in no essential respect from the form in which it is familiar to English readers. Many additional paragraphs are interspersed through its pages; the sections are marked more distinctly by headings in thick type; and the chemical processes both of the British and the United States Pharmacopœias are systematically explained.

Altogether, the Author seems to have bestowed every endeavour to render his manual as complete as possible. How successful he has been, may be inferred from the high estimation in which the book is held in this country, and from the satisfactory results attained during several years' experience of its use by the large classes of students in the laboratories at Bloomsbury Square.

An Elementary Handbook of Physics. With 210 Diagrams. By WILLIAM ROSSITER, F.R.A.S., etc. Blackwood & Sons, 1871.

This book will doubtless be acceptable to those who wish to skim lightly and easily over the surface of the subjects of which it treats. It is, however, better adapted to popular use than for the purpose to which it aspires, namely, to help young men who are preparing for matriculation or scientific degrees at the London University.

Select Methods in Chemical Analysis (chiefly Inorganic). By WILLIAM CROOKES, F.R.S., etc. Longmans, Green & Co., 1871.

This is a most valuable contribution to chemical literature. As explained by the compiler, this work is not intended to provide the student with a complete text-book of analysis, but rather with a laboratory companion containing information not usually found in ordinary works on analysis. The author has tested most of the new processes, which have appeared during the last twelve years in

the *Chemical News*; and as some of these have proved to be of great value, it was thought that a service would be rendered to analytical chemistry, if these trustworthy methods were systematically arranged in a convenient form for laboratory use. The writer of this notice may add, that from personal experience with some of the processes detailed in this collection, he believes them to be highly satisfactory. It seems rather a pity that a collection of this kind should have been restricted to matters which have appeared in the *Chemical News* only, since the result of such restriction is, that several important methods which have of late years come into use (for example in the estimation of nitric acid) are thus excluded. The contents of the book, however, take a very wide range, giving, as it does, to the processes for the detection and estimation of the "rare" elements equal prominence with the rest.

A Manual of Qualitative Analysis. By ROBERT GALLOWAY, F.C.S., etc. Fifth Edition. John Churchill & Sons, 1870.

This is a well-known treatise. The present edition exhibits all the good points and also many of the defects of former ones.

The plan of comparing the behaviour of the several members of a group of bodies when under the influence of the same reagent, is specially commendable. It enables and indeed compels the learner to see the reasons for selecting certain reactions in preference to others, for the purpose of identifying or of detecting a body. It is decidedly bad to tell him, as is frequently done, that a given metal will comport itself in such a manner, without at the same time informing him as to what occurs under like circumstances with another closely allied metal.

Quantitative Chemical Analysis. By Dr. C. REMIGIUS FRESENIUS. Fifth Edition. Edited by Arthur Vacher. John Churchill & Sons, 1870.

This book is noticed here because it has undergone such a complete change, that many will probably fail to recognise in it the familiar "Fresenius" of their student days. The instructions for manipulation—in former editions a prominent matter—are cut down to twelve pages; the estimation of metals receives sixty pages; that of acids about fifty pages, and the rest of the work in like proportion. The result of this immense condensation is not wholly advantageous. Details which are sometimes of considerable importance to a student being necessarily curtailed or sometimes

itted. This occurs particularly in the account of methods of variation. On the other hand, it is but justice to say that most of the new methods possessing any importance are introduced in their proper places, and that the arrangement of the matter has been so simplified as to render reference to any desired subject far more easy than formerly.

Laboratory Guide. A Manual of Practical Chemistry specially arranged for Agricultural Students. By A. H. CHURCH, M.A. Second Edition. Van Voorst, 1870.

Mr. Church is a Professor of Chemistry in the Royal Agricultural College at Cirencester, and this little book embodies the system of practical instruction in chemistry there pursued. It will be chiefly valuable to our readers on account of the processes for the analysis of soils, guanos, manure, oil-cake, etc., which are given in detail.

The work is divided into three parts. The first part treats of chemical manipulation, in a series of practical lessons adapted for those who are beginning a study of the science. Clear and concise directions are given for the performance of a number of simple operations, such as the making of gases, distillation of nitric acid, assaying of coins, etc. The second part is devoted to qualitative analysis, and describes the ordinary processes of detecting and separating the commonly occurring acids and bases. All reference to the rarer bodies is omitted. We venture to think that the author would do well to develop this section more fully in a future edition.

The third part comprises quantitative processes, and constitutes a special feature of the book. After a few exercises in simpler determinations, a set of excellent methods are given for the analysis of oils, natural and artificial manures, and cattle foods. These are well selected, and are thoroughly trustworthy. Mr. Church is well-known as a distinguished chemist; and we confidently recommend his work to all who require assistance in this branch of chemical analysis.

British Homœopathic Pharmacopœia. Published by the British Homœopathic Society, London, 1870.

It is no small indication of the activity and energy of the leading homœopaths in this country, that a compilation of this kind should have been issued by the British Homœopathic Society, and in

so creditable a form. Without referring in any way to the soundness or otherwise of the principles of homœopathy, it must in justice be admitted that the compilers of this work have performed their task well. It is true that they had the British Pharmacopœia of 1867 before them, and that the general arrangement and style of that edition have been adhered to pretty closely—nay, some articles have been transplanted bodily from that work into their pages; but the homœopathic materia medica includes such a wide and varied range of substances, many of which are not recognised in regular practice, that the greater part of the volume has been compiled independently of extraneous assistance of that kind. The paragraphs are cast in the same mould as those of the British Pharmacopœia; but, added to the name of each substance, are not only the ordinary English synonyms, but, in the case of plants, the names in several languages, the time of flowering, and to every preparation the “proper form for dispensing.” An addition corresponding to this last might advantageously be added in future editions of the British Pharmacopœia. There are many substances, especially those usually put up in the pilular form, which often lose no small proportion of their activity from injudicious selection of excipients. The matter at least deserves attention.

A Manual of Botany: including the Structure, Functions, Classification, Properties, and Uses of Plants. By ROBERT BENTLEY, F.L.S., etc. Second Edition. J. Churchill & Sons, 1870.

Professor Bentley is so well known as an able teacher of botany, and his manual is so thoroughly recognised among pharmacentists as the standard work on the subject, that it is unnecessary to enter upon any detailed review of this book. The first edition has been out of print for a long time, and second-hand copies have been eagerly purchased at a premium. Our readers will heartily join us in expressions of regret, at learning that the illness of the author has been the principal cause of delay in the appearance of the second edition.

The distinctive feature of Professor Bentley's manual is the prominence which is given to the properties and uses of plants; not only is additional interest thus imparted to the study of botany as a science, but an admirable foundation is also laid for the subsequent acquirement of knowledge in materia medica and economic botany. It is on this account that the book is so especially valuable to pharmacentists.

An Elementary Course of Botany, Structural, Physiological, and Systematic. By PROF. A. HENFREY, F.R.S., etc. Second Edition, revised and in part re-written by Maxwell T. Masters, M.D., F.R.S., etc. Van Voorst, 1870.

The arrangement of matter in this work is that best suited to enlist the attention of the beginner, and lead him on to a practical acquaintance with the scientific classification of plants. Instead of treating at the commencement of the somewhat abstruse and often repelling details of ultimate structure and physiology, this division of the science is reserved for the end of the book. The student is therefore at once introduced to the morphology of the distinct organs of the plant, or different forms of the root, stem, leaves, flowers, fruit, etc. This part is followed by systematic botany, and the natural orders are clearly but succinctly described. The advantage of such an arrangement is, that the most easily studied and more readily acquired branches of the subject are brought first under notice.

It may be objected that the work loses somewhat of logical sequence, by this method; but we are inclined to think that this is of less importance than at first appears.

Of the manner in which each subject is treated we need say nothing; the names of the distinguished authors are a sufficient guarantee of the excellence of the matter.

The Student's Flora of the British Islands. By J. D. HOOKER, C.B., M.D., D.C.L., Director of the Royal Gardens, Kew. London: Macmillan & Co., 1870.

This work is exactly what its name implies—a student's book. It is something more than a mere key to the recognition of British plants. Written by a master hand, it is intended to create sound habits of observation, and induce a philosophic idea of botanical classification, thereby qualifying the student to acquire a more extended acquaintance with his science. While everything leading to superficial knowledge is avoided, however, nothing unnecessarily abstruse is introduced. A handy volume of some 520 pages, it is admirably suited to be a field companion to all who have mastered the mere rudiments of botany.

The author has taken the well-known "London Catalogue of British Plants," 6th ed., 1867, as his guide for the number and kinds of plants introduced as composing the British Flora proper; and a list of excluded species is given in an Appendix.

The arrangement adopted is that of De Candolle, and a synopsis of the natural orders is given at the commencement. The generic, and specific characters have been rewritten, and are entirely original, the object of the author being to furnish the reader with a fuller account of the plants than is usually given in manuals. It is this which constitutes the chief excellence of the work.

We cannot part with the book, however, without finding fault—but for which the author is hardly responsible. A book likely to be carried about on country excursions, should of course be as compact and light as possible; yet the publishers have thought fit to bind in with it 54 pages of advertisements!

PROCEEDINGS
OF THE
British Pharmaceutical Conference
AT THE
EIGHTH ANNUAL MEETING
AT
EDINBURGH.
1871.

EDITED BY
PROFESSOR ATTFIELD.

CONTENTS.

CONSTITUTION AND RULES OF THE CONFERENCE.

ALPHABETICAL LIST OF MEMBERS' NAMES AND ADDRESSES.

ALPHABETICAL LIST OF TOWNS AT WHICH MEMBERS RESIDE.

PROGRAMME OF TRANSACTIONS OF THE CONFERENCE AT EDINBURGH, INCLUDING
TITLES OF PAPERS.

THE TRANSACTIONS OF THE CONFERENCE, INCLUDING THE PAPERS READ, AND
THE DISCUSSIONS THEREON.

GENERAL INDEX TO THE YEAR-BOOK AND TRANSACTIONS.

British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and, when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of Purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

Any person desiring to become a member of the Conference, shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds the votes given being needful for his election. If the application be made during the year, the Executive Committee may elect the candidate by a unanimous vote.

The subscription shall be 5s. annually, which shall be due in advance, upon July 1.*

Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, providing that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

The Officers of the Conference shall be a President, four Vice-presidents by election, past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one Joint Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

At each Conference, it shall be determined at what place and time to hold that of the next year.

Two members shall be elected by the Conference to audit the Treasurer's accounts, and audited accounts to be presented annually.

The Executive Committee shall present a report of proceedings annually.

These Rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

*. * Authors are specially requested to send the titles of their Papers to either of the General Secretaries two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

* Members will please also to transmit 6d. for postage of Year-Book—Total, 5s. 6d.

FORM OF NOMINATION.

I Nominate

Name)

Address)

a Member of the British Pharmaceutical Conference.

Member.

Signature)

The nomination must be legibly written, and forwarded to one of the Honorary General Secretaries, Prof. ATTFIELD, 17, Bloomsbury Square, W.C., or Mr. F. BADEN BENGER, 1, Market Place, Manchester, either of whom, or any other officer or member, will duly sign the nomination.

Students and Assistants, as well as Principals, are invited to become members.

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* * *The Secretaries will be glad to receive notice of any inaccuracies in the lists of members.*

Number of Members, 1900.

LIST OF MEMBERS.

For Alphabetical List of Towns, see page 506.

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am, Mr. J., 87, Bold Street, Liverpool.
s, Mr. A. A., Woolston, Southampton.
s, Mr. F., Stoke-on-Trent.
s, Mr. G., The Old Cross, Hertford.
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s, Mr. J. H., Stoke-on-Trent.
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l, Mr. J., Broughton Street, Edinburgh.
l, Mr. R., 73, Princes Street, Edinburgh.
l, Mr. W., 3, Pitt Street, Edinburgh.
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ht, Mr. J., Penny Street, Lancaster.
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ter, Mr. C. J., 40A, New Street, Birmingham.
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ong, Mr. J., Newgate Street, Bishop Auckland.
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 Baker, Mr. F. B., 195, Queen's Road, Dalston, E.
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 Baker, Mr. P. C., Swaffham.
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 tin, Mr. E., 32, Church Street, Stoke Newington, London, N.
 sman, Mr. T. H. M., 27, Manbey Grove, Stratford, E.
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 ting, Mr. T. G., 2, Montpellier Terrace, Cheltenham.
 ter, Mr. G., Folgate Street, Chester.
 ley, Mr. J. T., Broomhills, near Walsall.
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 l, Mr. F. R., Sussex Street, Middlesboro-on-Tees.
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 l, Mr. M. W., 143, New Bond Street, London, W.
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 ing, Mr. T., 143, New Bond Street, W.
 gley, Mr. J., Northampton.
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 yles, Mr., J. H., junr., 311, Hackney Road, E.

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 ameron, Mr. W., Kelso.

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 Cawdell, Mr. G., 12, London Street, Hyde Park, W.
 Challinor, Mr. S. M., 35, Deansgate, Bolton.
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 Clark, Mr. J., 56, Hanover Street, Liverpool.
 Clark, Mr. J. W., Belvoir Street, Leicester.
 Clarke, Mr. A., 45, Blanket Row, Hull.
 Clarke, Mr. G. B., Park Street, Woburn.
 Clarke, Mr. R. F., 11, Strand, Torquay.
 Clarke, Mr. T. M., Richmond, Surrey.
 Clarke, Mr. T., 19, Market Place, Stockport.
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 Clayton, Mr. W., 41, Wicker, Sheffield.
 Cleave, Mr. W., Chudleigh.
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 Cockniss, Mr., Teignmouth.
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 Cole, Mr. W. T., 16, St. Mary Street, Weymouth.
 Coleman, Mr. A., 13, St. Mary-at-Hill, E.C.
 Coles, Mr. F., South Kensington Museum, W.
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 Cooke, Mr. W., 27, St. Giles, Norwich.
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 Cooper, Mr. G., 101, Fore Street, Exeter.
 Cooper, Mr. J. N., Mall, Clifton, near Bristol.
 Cooper, Mr. S. H., West Hartlepool.
 Cooper, Mr. T., Leicester.
 Cooper, Mr. T., 30, Walmgate, York.
 Cooper, Mr. W. W., 2, Amberst Road, N.
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 Jottrill, Mr. W. H., Snargate Street, Dover.
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 Cunliffe, Mr. N., 41, Crook Street, Bolton.
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 Curtis, Mr. R., 86, New Bond Street, W.
 Curtis, Mr. T., 35, Haymarket, S.W.
 Curtis, Mr. T. W., Holbeach, Lincolnshire.
 Curtis, Mr. W., Barnstaple.
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 Cutting, Mr. J., Leamington.
 Cutting, Mr. T. J., Selby.

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 Evans, Mr. J. H., Market Cross, Lymm, Cheshire.
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 Farnworth, Mr. W., Blackburn.
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 Farrage, Mr. R., Rothbury, Northumberland.
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Foster, Mr. J., Collumpton.
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Gill, Mr. S., 57, Broad Street, Pendleton, Manchester.
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 Greaves, Mr. E., Mexbro', Rotherham.
 Greaves, Mr. J., Crewkerne, Somerset.
 Greaves, Mr. W. S., Ironville.
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 Groves, Mr. A., Earl Street, Cambridge.
 Groves, Mr. T. B., F.C.S., Weymouth.
 Groves, Mr. W. E., Blandford, Dorset.

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 Hall, Mr. J., 5, Russell Street, Liverpool.
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 Hall, Mr. W., Market Street, Lancaster.
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 Hanbury, Mr. D. B., Clapham Common, S.W.
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 Harding, Mr. R. O., Belvedere, Bath.
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 Hartley, Mr. W., 7, Church Street, St. Andrews.
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 Hayes, Mr. J., Great Warley, Essex.
 Hayhoe, Mr. W., Diss.
 Hayland, Mr. W. C., 20, High Onsegate, York.
 Hayles, Mr. B. H., Esplanade, Ealing, Middlesex.
 Hayward, Mr. C. J., Lincoln.
 Hayward, Mr. W. H., Trowbridge, Wilts.
 Heald, Mr. B., Sleaford.
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 Header, Mr. W., 1, Victoria Parade, Torquay.
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 Henderson, Mr. M. J., Main St., Keswick.
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Hill, Mr. T., Bath.
Hill, Mr. W., 41, Union Street, Bishopsgate, E.C.
Hill, Mr. W. G., 58, George Street, Edinburgh.
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 Jackson, Mr. J. P., 9, Trinity Square, Borough, S.E.
 Jackson, Mr. J. T., Middleton Road, Chadderton, Oldham.
 Jackson, Mr. J., York Street, Heywood.
 Jackson, Mr. R., 35, Drury Hill, Nottingham.
 Jackson, Mr. W., Crediton, Devon.
 Jackson, Mr. W., Mansfield.
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 hnson, Mr. S. E., Ashby-de-la-Zouch.
 hnson, Mr. T., 80, Walgate, Wigan.
 hnson, Mr. T. S., 75, Bury New Road, Manchester.
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 nes, Mr. C., 7, Market Square, Hanley.
 nes, Mr. E. H., Monmouth Street, Monmouth.
 nes, Mr. E. P., Rhyl.
 nes, Mr. F., 83, Oxford Street, Liverpool.
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 nes, Mr. H. S., 139, Fulham Road, S.W.
 nes, Mr. J. H., 9, Finsbury Place North, E.C.
 nes, Mr. K. L., Bagillt, Flintshire.
 nes, Mr. M., Flint.
 nes, Mr. R., 126, Bridge Street, Chester.
 nes, Mr. R. G., Commercial Place, Lye, Stourbridge.
 nes, Mr. S. U., 4, Upper Parade, Leamington.
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 nes, Mr. W., 157, Great Howard Street, Liverpool.
 nes, Mr. W. J., Jamaica Row, Birmingham.
 y, Mr. F. W., 17, Duke Street, Cardiff.
 ddd, W., F.C.S., 10, Bath Street, Leamington.

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 aye, Mr. H., Berry Brow, Huddersfield.
 arnes, Mr. R. H., Swan Bank, Bilston.
 eene, Mr. E., 143, New Bond Street, W.
 eene, Mr. J., 74, New Bond Street, W.
 emp, Mr. D., 106, High Street, Portobello, Mid-Lothian.
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 endall, Mr. F., Stratford-on-Avon.
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 Newby, Mr. R. J., Castlenau, Barnes, S.W.
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 Thurlby, Mr. G., King Street, Yarmouth.
 Tibbs, Mr. F., 47, Blackfriars Road, S.E.
 Tichborne, C. R. C., F.C.S., 40, Mary Street, Dublin.
 Tidman, Mr. W., 10, Wormwood Street, E.C.
 Tigar, Mr. H. B., 2, Drapery, Northampton.
 Tighe, Mr. H. W., High Street, Exeter.
 Tilden, W. A., D.Sc., F.C.S., 17, Bloomsbury Square, W.C.
 Tipping, Mr. H. J. W., High Street, Stoke Newington, N.
 Titley, Mr. T., 44, Charlotte Street, Fitzroy Square, W.
 Todd, Mr. J., English Street, Carlisle.
 Todd, Mr. R. P., 16, Robertson Street, Hastings.
 Tollinton, Mr. R. B., York.
 Tomlinson, Mr. G. D., Bristol Road, Birmingham.
 Tomlinson, Mr. W., 2, Albert Bridge, Manchester.
 Toone, Mr. J. H., Granby Street, Leicester.
 Toone, Mr. J. A., East Street, Warminster.
 Towerzey, Mr. A., 7, Regent Place, Clifton, near Bristol.
 Townsend, Mr. C., 4, Union Street, Bristol.
 Tozier, W., L.A.H.I., Alexandra Terrace, Bloomfield Avenue,
 Dublin.
 Troakes, Mr. W. H., Kingsbridge, Devon.
 Trotman, Mr. A. C., 16, Cambridge Street, Hyde Park Square, W.
 Troughton, Mr. C., 72, Old Hall Street, Liverpool.
 Truman, Mr. F. W., 187, Newington Butts, S.E.
 Truman, Mr. H. W., 1, Angleside Villas, Streatham, S.W.
 Tully, Mr. J., senr., East Grinstead, Sussex.
 Tupholme, Mr. J. T., 38, Lamb's Conduit Street, W.C.
 Turner, Mr. A., Fairfield, Liverpool.
 Turner, Mr. C. E., 63, Great Russell Street, W.C.
 Turner, Mr. G., Honiton.
 Turner, H., M.R.C.S., Toad Street, Rochdale.
 Turner, Mr. J. (Messrs. Bell & Riddle), Market Place, Hexham.
 Turner, Mr. J., 386, High Street, Lincoln.
 Turner, Mr. J., Aylesbury.
 Turner, Mr. J. A., Whitfield Road, Liverpool.
 Turney, Mr. S. B., Plymouth.
 Tuson, Prof. R. V., F.C.S., Royal Veterinary College, Camden Town, N.W.
 Twemlow, Mr. F. E., 452, Edgware Road, W.
 Twinberrow, Mr. J. K., 80, Wigmore Street, Cavendish Square, W.
 Twinberrow, Mr. J., 53, Broad Street, Worcester.
 Tylee, Mr. J. P., Bath.
 Tyrer, Mr. P., 90, Albert Road, Dalston, E.

Umney, C., F.C.S., 40, Aldersgate Street, E.C.
 Uppleby, Mr. H., 6, Victoria Street, Leamington.
 Upton, Mr. E. J., Wallingford, Berks.
 Utley, Mr. A., 6, Mount Vernon Road, Liverpool.
 Utting, Mr. C. E., Diss.

Vennall, Mr. G., Cranleigh, Guildford.
 Vergo, Mr. C., The Foregate, Worcester.
 Verity, Mr. R., 35, Warwick Street, Regent Street, W.
 Voce, Mr. W. G., Dudley Street, Brierley Hill.

Wade, Mr. J., 174, Warwick Street, Pimlico, S.W.
 Wade, Mr. W., 2, Naval School Buildings, New Cross, S.E.
 Waite, Mr. J. H., Cawood, Yorks.
 Wakefield, Mr. T., Church Parade, Hounslow.
 Wakeham, Mr. C., Helston.
 Walford, Mr. R. J., St. Albans' Row, Weymouth.
 Walkden, Mr. J., Birkenhead.
 Walker, Mr. B. W., 26, Clapham Road, S.W.
 Walker, Mr. C. W., 180, Falkner Street, Liverpool.
 Walker, Mr. D. P., 125, New City Road, Glasgow.
 Walker, Mr. J., Manchester Road, Bradford, Yorkshire.
 Walker, Mr. J., 124, High Street, Tewkesbury.
 Walker, Mr. J. D., 1, Abbey Street, Carlisle.
 Walker, Mr. J. S., 77, Great Ducie Street, Manchester.
 Walker, Mr. W., Broad Street, Bath.
 Wall, Mr. T., The Hospital, West Bromwich.
 Wallwork, Mr. J., Tyldesley, near Manchester.
 Walpole, Mr. W., White Lion Road, Yarmouth.
 Walsh, Mr. E., 209, York Street, Cheetham, Manchester.
 Walton, Mr. R., 286, High Street, Exeter.
 Walton, Mr. B. B., Lichfield.
 Ward, G., F.C.S., Mechanics' Institution, Leeds.
 Ward, Mr. W., 3, Wool Market, Berwick-on-Tweed.
 Ward, Mr. W. B., 8, High Street, Little Lever, Bolton.
 Warhurst, Mr. W. T., 102, Great Homer Street, Liverpool.
 Warneford, Mr. F., Queen's Road, Brighton.
 Warner, Mr. C. H., 55, Fore Street, E.C.
 Warner, Mr. G. T., 1, Mall, Clifton, Bristol.
 Warrand, Mr. T., Old Brentford, Middlesex.
 Warren, Mr. G., 16, Guilford Road, Brighton.
 Warren, Mr. T. T. P. B., F.E.S., Tamworth Ho., Mitcham Comm., S.
 Warrior, Mr. H., Northallerton.
 Wastie, Mr. F. W., 183, Lower Kennington Lane, S.E.
 Waterall, Mr. G. E., Nottingham.
 Waterhouse, Mr. J., Ashton-under-Lyne.
 Watkinson, Mr. J. W., Kearsley, Farnworth, Bolton.
 Watling, Mr. A., 59, Camberwell New Road, Kennington, S.E.
 Watson, Mr. J. (Messrs. Hurst & Co.), Aire Street, Leeds.
 Watson, Mr. D., Park Crescent, Torquay.
 Watson, Mr. G. P., Lower King Street, Norwich.
 Watson, Mr. J. E. H., Rose Lane, Norwich.
 Watson, Mr. T. D., 18a, Basinghall Street, E.C.
 Watson, Mr. T. E., 75, Clayton Street, Newcastle-on-Tyne.
 Watts, Mr. W., 10, Bedford Terrace, Kensington, W.
 Watts, Mr. E. P., Dorchester, Dorset.
 Watts, J., D.Sc., 57, Baker Street, W.
 Watts, W. M., D.Sc., F.C.S., Beachfield, Bowdon, Cheshire.
 Waugh, Mr. A., 177, Regent Street, W.

ough, Mr. G., 177, Regent Street, W.
 uring, Mr. W., 37, Cheapside, Lancaster.
 over, Mr. E., 29, Chapel Street, Belgrave Square, W.
 bb, Mr. E. A., 56, Hanover Street, Liverpool.
 bster, Mr. S. M., 33, Bridge Street, Warrington.
 bster, Mr. G., Church Street, St. Helen's.
 ir, Mr. J. S., Market Square, Merthyr.
 bury, Mr. G., Bridge Gate, East Bedford.
 leh, Mr. C., 20, Sussex Place, Reading.
 ller, G., J.P., Queen's Terrace, Windsor.
 llington, Mr. J. M., Oakham, Rutland.
 lah, Mr. T., 29, Mosley Street, Newcastle-on-Tyne.
 st, Mr. E. B., 17, Strand, Dawlish.
 st, Mr. J., 15, Fleet Street, Torquay.
 st, Mr. T., Stretford, Manchester.
 ston, Mr. C., 4, Regents Parade, Mill Street, Ventnor, Isle of Wight.
 ston, Mr. S. J., 151, Westbourne Terrace, W.
 strap, Mr. J., 76, Kensington Park Road, W.
 stwood, Mr. W. B., 16, Newgate Street, E.C.
 stwood, Mr. A., Dudley Street, Brierley Hill.
 easton, Mr. W. F., Ringwood, Hants.
 ealdon, Mr. J., 217, Stockport Road, Manchester.
 eeler, Mr. A. A., Sullivan's Quay, Cork.
 eeler, Mr. J., Chipping Sodbury.
 ile, Mr. W. J., Victoria Road, Ebbw Vale, Monmouth.
 incup, Mr. W., 404, Essex Road, Islington, N.
 itburn, Mr. A. R., 174, Regent Street, W.
 ite, Mr. E. A., Mayfield, Hawhurst.
 ite, Mr. F., London Road, Nottingham.
 ite, Mr. J., 20, Paterson Street, Glasgow.
 itfield, Mr. H., Worcester.
 itfield, J., F.C.S., 18, Westbro', Scarborough.
 itla, Mr. J., Monaghan, Ireland.
 itrod, Mr. H. F., Diss.
 ittaker, Mr. W., Runcorn.
 ittle, Mr. S., Leigh, Lancashire.
 ittles, Mr. H., Wheeler Street, Lozells, Birmingham.
 itworth, Mr. J., Littleboro, near Manchester.
 yte, Mr. W., 554, St. Vincent Street, Glasgow.
 gin, Mr. J., 34, St. Matthew's, Ipswich.
 l, Mr. J., Clarendon Place, Hyde, Cheshire.
 lay, Mr. G. E., Market Place, Bicester, Oxon.
 kinson, Mr. G., 267, Waterloo Road, Manchester.
 kinson, Mr. W., 114, Lambeth Walk, S.E.
 kinson, Mr. W., Church Street, Colne.
 kinson, Mr. W., 263, Cheetham Hill, Manchester.
 liams, Mr. C. H., 2, Langland Villas, Mumbles, Swansea.
 liams, Mr. C. J., Smith Street, St. John's, Warwick.
 liams, Mr. D. P., Llanberis, Carnarvon.
 liams, Mr. E. V., 67, St. Thomas Street, Weymouth.
 liams, Mr. G. L., Burnham, Bridgewater.
 liams, Mr. H. W., 1, High Street, Barmouth.
 liams, Mr. J. B., Kingswinford, near Dudley.
 liams, J., F.C.S., 5, New Cavendish Street, W.
 liams, Mr. J. E., The Eastgate, Chester.
 liams, Mr. J. J., 13, Desburch Place, Harrow Road, Paddington, W.
 liams, Mr. J. V., 15, South Terrace, St. Ives, Cornwall.
 liams, Mr. P., 21, West Street, Horsham.
 liams, Mr. R., Middleton, Manchester.
 liams, Mr. R., 2, Gresham Place, East Brixton, S.W.

Williams, Mr. R. W., Dolgelly.
 Williams, Mr. W. H., 13, Upper Baker Street, W.
 Williams, Mr. W. P., Long Row, Nottingham.
 Williams, Mr. W., 29, Red Lion Square, W.O.
 Williams, Mr. W., 265, Crown Street, Liverpool.
 Williamson, Mr. D., Stoke Terrace, Guildford.
 Williamson, Mr. T. U. (Mr. Hind's), Coventry.
 Willis, Mr. B. W., 11, Farfield, Kidderminster.
 Willis, Mr., King's Lynn, Norfolk.
 Willmott, Mr. W., King's College Hospital, W.C.
 Willmott, Mr. W., 83, High Street, Borough, S.E.
 Willsheer, Mr. S., Brunswick House, Tenterden.
 Wilmer, Mr. J. G., 13, Bridge Street, Hull.
 Wilson, Mr. E., The Moor, Sheffield.
 Wilson, Mr. E. W., 102, Westbourne Street, Everton, Liverpool.
 Wilson, Mr. J., 35, High Street, Perth.
 Wilson, Mr. J., Penrith, Cumberland.
 Wilson, Mr. J. W., 3, Bootham, York.
 Wilson, Mr. R., Clay Cross, Chesterfield.
 Wilson, Mr. W., 21, High Street, Hanley, Staffordshire.
 Wilt, Mr. H. H., Prescott Road, Old Swan, Liverpool.
 Windsor, Mr. G., East Cornwall House, Torpoint, Devonport.
 Wing, Mr. T., Melton Mowbray.
 Wink, Mr. J. A., 17, North Bridge, Edinburgh.
 Witherington, Mr. T., 7, Foregate Street, Worcester.
 Wolferstan, Mr. G. D., Midhurst, Sussex.
 Wood, Mr. A., New Brentford, Middlesex.
 Wood, C. H., F.C.S., 300, High Holborn, W.C.
 Wood, Mr. E., 49, Berners Street, W.
 Wood, Mr. E. B., 46, Holloway Road, Birmingham.
 Wood, Mr. J., 8, New Street, Barnsley.
 Wood, Mr. W. A., 41, Church Street, Hunslet, Leeds.
 Woodburn, Dr. J. C., 8, South Portland Street, Glasgow.
 Woodcock, Mr. J., 177, Scotland Road, Liverpool.
 Woodhead, Mr. J. T., 29, Paradise Street, Liverpool.
 Woodstock, Mr. C., Woburn, Bedfordshire.
 Woodward, Mr. J. L., Bridgwater.
 Woodward, Mr. W., Chapter Bar, Nottingham.
 Woolley, Mr. H., 69, Market Street, Manchester.
 Woolley, Mr. G. S., 69, Market Street, Manchester.
 Woolley, Mr. G., 48, Arkwright Street, Nottingham.
 Wootton, Mr. A. C., 44A, Cannon Street, E.C.
 Worfolk, Mr. F., 57, Bridge Street, Bolton.
 Worts, Mr. A., Harwich.
 Wovenden, Mr. H., Sale, Manchester.
 Wright, Mr. A., 51, London Road, Lowestoft.
 Wright, C. B. A., D.Sc., F.C.S., Chemical Laboratory, St. Ma
 Hospital, W.
 Wright, F., L.S.A., Stamford Bridge, York.
 Wright, Mr. G., 29, Congreve Street, Birmingham.
 Wright, Mr. J. A. (Mr. Morton,) Ramsbottom.
 Wright, Mr. J., Chesterfield.
 Wright, Mr. J., 165, King Street, Yarmouth.
 Wright, Mr. W. C., 55, Great Scotland Road, Liverpool.
 Wright, Mr. W. F., 1, Wellington Street, Leamington.
 Wright, Mr. W. V., 50, Southwark Street, S.E.
 Wyatt, Mr. H., 12, Derby Road, Bootle, Liverpool.
 Wylde, Mr., Hyde, Manchester.
 Wyles, Mr. B., Bourne.
 Wyley, Mr. W. F., Hertford Street, Coventry.

10, Mr. E. P., 33, High Street, Stratford-on-Avon.

10, Mr. F., Horsforth, near Leeds.

3, Mr. G., 60, Lamb's Conduit Street, W.C.

8, Mr. T. F., 68, Market Street, Manchester.

11, Mr. E., Wade Lane, Leeds.

g, Mr. H. T. B., 6, All Saints Street, Beverley Road, Hull.

g, Mr. J., Folds Road, Bolton.

g, Mr. J. C., Warrington.

g, Mr. J. R., 17, North Bridge, Edinburgh.

g, P., F.R.C.S.Edin., 28, Ann Street, Dundee.

g, Mr. R. F., New Barnet, N.

g, Mr. W., 8, Neeld Terrace, Harrow Road, W.

g, Mr. W. F., High Street, Salisbury.

ger, Mr. T., Brampton, Cumberland.

BRITISH PHARMACEUTICAL CONFERENCE 1869-70.

ALPHABETICAL LIST OF TOWNS AT WHICH MEMBERS RESIDE.

*The names to which an asterisk is attached are those of Local Secretaries.
For Alphabetical List of Names, see page 473.*

Aberystwith. Davies, J. T.	Attleborough. Clowes, W. C.	Dutton, C. Ekin, C. Harding, R. Hill, T. Lear, W. M. Marsh, J. H. Merrickin, J. *Pooley, J. C. Quarrington, W. R. Tylee, J. P. Walker, W.
Accrington. Astin, E.	Axminster. Gunn, F. J.	
Adlington, Lancashire. Shepherd, C. W.	Aylesbury. Turner, J.	
Alcester. Simmons, A.	Aylsham. Nicholson, G. D. Nicholson, S.	
Alfreton. Robinson, J. S.	Bacup. Mace, J.	Bawtry. Jackson, F. J.
Alnwick. Hunter, H. Newbigen, J. S.	Bagillt. Jones, K. L.	Beckenham, Kent. Day, T. S.
Alston. Thompson, G.	Banbury. Ball, G. V.	Bedale. Metcalfe, W. C.
Altrincham. Hughes, J. T.	Barmouth. Williams, H.	Bedford. Anthony, J. L.
Amphill. Brown, J.	Barnard Castle. Badcock, J.	Belper, Derbyshire. Burkinshaw, W.
Arbroath. Burns, D. H. Ogilvie, G. P.	Barnstaple. Curtis, W. Symons, W.	Beeston. Faull, E.
Ashby-de-la-Zouch. Johnson, S. E.	Barnsley. Ellison, J. B. Iberson, J. Wood, J.	Berwick-on-Tweed. Davidson, J. Ward, W.
Ashford, Kent. Ingall, J.	Basingstoke. Sapp, A.	Beverley. Duck, W. B.
Ashton-under-Lyne. *Bostock, W. Fisher, E. Waterhouse, J.	Bath. Barnitt, F. Brooke, O. Commans, R. D. Dudden, R. M.	Bewdley. Newman, R.

R. B.	Bishop Auckland.	Borrowstowness,
E.	Armstrong, J.	N. B.
	Harburn, R. H.	Hughes, F. R.
	Leigh, J. J.	
at.	*Robinson, J.	Boston.
	Thorburn, H.	*Marshall, R.
		Pilley, S.
	Bishop's Castle.	Queenboro, J.
	Owen, J.	Thomas, J. H.
		Scruton, P. D.
	Blackburn.	Boston Spa.
	Booth, J.	Gill, H.
H.	Farnworth, W.	
	Moulden, W.	Bourne.
	Blackpool.	*Mills, R. M.
	Sharples, G. W.	Roberts, J. B.
	Blairgowrie.	Wyles, B.
I.	Crerar, J.	Bournemouth.
	Grant, W.	Mason, J.
J.	Blandford.	Bowdon, Cheshire.
J.	Groves, W. E.	Watts, W. M.
	Bloxham, Oxon.	Bradford-on-Avon.
	Newey, J. T.	Saunders, T. P.
H.	Bognor.	Bradford, York-
3.	Long, A.	shire.
W.	Bolton, Lancashire.	Beanland, S.
	Blain, W.	Bell, F.
	Challenor, S. M.	Boast, J.
	Cunliffe, J.	Harrison, T.
	Cunliffe, N.	Henderson, C.
J.	Dearden, W.	Hick, J.
3.	Dutton, F.	Lister, S.
	Fisher, W.	Metcalfe, A. A.
C.	Griffin, G. E.	Newaholme, W.
	Grisdale, T.	*Parkinson, R.
	Hamer, J.	Pullan, T.
	Hampson, P.	Rimmington, F. M.
	Hart, W.	Rogerson, M.
	*Harwood, E. G.	Silson, R. W.
	Heap, R.	Stead, T.
S.	Hothersale, J.	Walker, J.
T. W.	Knott, R.	
	Leather, W.	Brampton, Cum-
	Morris, T.	berland.
J.	Oldham, P.	Younger, T.
G.	Pownall, T. R.	
	Priestley, J.	Brechin, N. B.
	Richardson, F.	Hodgeton, D.
	Stronge, R.	
	Taylor, W.	Brentwood, Essex.
	Ward, W. B.	Guest, E. P.
G. D.	Watkinson, J. W.,	
	(Farnworth).	Brentford (New),
	Worfolk, F.	Middlesex.
	Young, J.	Wood, A.

Brentford (Old),
Middlesex.
Warrand, T.

Bridge, Kent.
Thomas, J.

Bridge of Allan,
N. B.
Farie, G.

Bridgewater.
Williams, G. L.
Woodward, J. L.

Bridport.
Beach, J.

Brierley Hill.
Steward, J.
Voce, W. G.
Westwood, A.

Brighton.
Aldridge, J.
Appleby, E. J.
Armitage, E. H.
Barton, H.
Blacklock, J. D.
Bradley, J. D.
Brew, T. A.
Colby, J., sen.
Cornish, W.
Dowsett, A.
Edwards, J.
Else, W.
Field, J.
Foster, F.
Gardner, J. T.
Glaisyer, T.
Griffin, T.
Guy, F.
Gwatkin, J. T.
Haffenden, T.
Harris, E. R.
Kemp, J.
Long, —
Matthews, J. H.
Merrett, —
Noakes, R.
Padwick, T.
Phillips, J.
Salmon, —
*Savage, W. D.
Savage, W.
Schweitzer, J.
Smith, W.
Smith, W. H.
Stevens, W. G.
Warneford, F.
Warren, G.

Brill.
Holmes, F. G.

Bristol.
Berry, W.
Boucher, J.
Bourne, C.
Bush, T. (Paulton).
Cuff, R. C.
Flower, E.
Glossop, G. E.
Hatch, R. M.
Kent, G. F.
Lockyer, W. J.
Martin, F. R.
Pitman, J.
Saunders, T. C.
Sprackett, G.
*Stoddart, W. W.
Stoddart, W. W. B.
Townsend, C.

Bromsgrove.
Haines, J. J.

Bromwich, West.
*Birch, W.
Green, J.
Holliday, T.
Pershouse, E.
Roberts, G.
Wall, T.

Buckley, Mold.
Caunt, W. F.

Burnley.
Crawshaw, E.
Hay, D. (Nelson).

Bury, Lancashire.
Pennington, T.

Bury St. Edmunds.
*Floyd, T.
Gross, W.
Hardwicke, E. J.
Jenner, C. S.
Palmer, A. N.

Burslem.
*Blackshaw, S.
Guest, G. C.
Leicester, T.
Oldham, W.

Buxton.
Ball, E.

Caistor, Lincoln-
shire.
Levick, G. A.

Cambridge.
Church, H. J. —
*Deck, A.
Groves, A.
Sussum, F.

Canterbury.
Amos, D.
*Harvey, S.
Reeve, W.

Cardiff.
Joy, F. W.

Carlisle.
Daniel, J.
Fisher, J. J. —
Gibson, C.
Hallaway, J. — P.
Harrison, J. —
*Moss, W.
Slack, J.
Sowerby, J. — A.
Thompson, —
Todd, J. —
Walker, J. — D.

Carmarthen —
Rees, D.

Castleford.
Farrer, C.

Cawwood.
Waite, J. — H.

Chatteris.
Langman, — P.

Cheltenham.
Balcombe, — J.
*Barron, — W. G.
Batting, —
Butcher, —
Finch, J. —
Fletcher, —
Forth, W. —
Horsley, —
Jeffrey, T. — A.
Smith, N. —

Chertsey.
Boyce, G. —

Chester.
Baxter, — G.
Evans, J. —
Higgins, —
Hodges, —
Jones, R. —

d, T. J. E.	Corbridge-on-Tyne. Stainthorpe, W. W.	Crieff. McGregor, D.
d. R. f.	Colchester. Chaplin, J. R. Prosser, E. T.	Darlington. Robinson, A. F. Robson, J. C. *Swenden, J.
.Street. . J. om, J. . J.	Coldstream, N. B. Dodds, N.	Dartmouth. Cutcliffe, G. F.
Sodbury. f.	Collumpton. Foster, J. Salter, T.	Darwen, Lancs. Grime, T. Shorrock, R.
	Colne, Lancashire. Asquith, W. C. Wilkinson, W.	Dawlish. Kay, R. West, E. R.
	Coltishall, Norfolk. Smith, W. L.	Deal. Clarabut, J.
f.	Colyton. Bartlett, H., junr. Rogers, W. H.	Derby. Barnes, B. Bloor, J. Evans, B. *Fröst, G. Hart, C. D. Ison, F. Medley, W. Ritchie, J. M. Stevenson, R.
tretton, f. Glou- e. W.	Cork. Cooke, J. (Des- borough. Richardson, J. H. Selkirk, J. Wheeler, A. A.	Devonport. Breeze, -- Codd, F. Radford, J. C. Bray, R. Windsor, G. (Tor- point).
. H. S.	Coventry. Bailey, T. Hinds, J. Hinds, W. Hodgkinson, G. Marlow, F. W. *Powers, E. Williamson, T. V. Wyley, W. F.	Dewsbury. *Craven, F. Fox, G. Robinson, J. R.
-Moors. M.	Cradley Heath. Nock, J.	Diss. Amyot, T. E. Cupiss, F. Francis, W. H. *Gostling, T. P. Hayhoe, W. Thrower, E. A. Utting, C. E. Whitrod, H. F.
n. H. W.	Crediton. Jackson, W. Smith, A.	
forti-	Crewe. Phillips, J.	
P.	Crewkerne. Greaves, J. Harris, M. C. J. Pearce, J.	
lstol. N. W. J. F. F. A. T.		
th. n, J.		
h, T.	Crickhowell. Christopher, W.	Dolgelly. Morris, E. Williams, R. W.

- Doncaster.**
 Howorth, J.
 Parkin, O.
 Shaw, H. W.
 Stiles, M. H.
- Dorchester.**
 Watts, E. P.
- Dover.**
 Baker, G.
 *Bottle, A.
 Bolton, J.
 Brown, J. F.
 Cottrill, W. H.
 Forster, R. H.
 Hambrook, J. B.
 Peake, H.
 Thompson, E.
- Driffield.**
 Sterriker, J.
- Droitwich.**
 Taylor, E.
- Dublin.**
 Draper, H. N.
 Evans, J.
 Frazer, W.
 Hamilton, J.
 Hoffe, P.
 Postans, A. P.
 Simpson, R.
 *Tichborne, C. R. C.
- Dudley.**
 *Dennison, M.
 Dunn, E.
 Gare, C. H.
 Perry, G. E.
 Williams, J. B.
- Dukenfield.**
 Avison, J.
- Dumbarton.**
 Babbie, J.
- Dumfermline.**
 Seath, A.
 Steill, G.
- Dundee.**
 Anderson, A. B.
 Doig, W.
 Hardie, J.
 Henderson, W. P.
 *Hodge, J.
 Jack, G.
- Kerr, C.
 Laird, W.
 Mackay, G. B.
 Miller, T. S.
 Park, W.
 Russell, J.
 Sandeman, P.
 Young, P.
- Dunkeld.**
 McDonald, K.
- Dunstable.**
 Staffell, H.
- Duntrocher.**
 Stanford, E. C. C.
- Durham.**
 *Burdon, J.
 Ferrero, A. P.
 Hunter, F. N.
 Lambert, J.
 Leighton, J. H.
 Sarsfield, W.
- Ealing, Middlesex.**
 Hayles, B. H.
- Easingwold.**
 Rookledge, J.
- Eastbourne.**
 Hall, S.
- East Dereham.**
 Lenton, W. H.
- East Grinstead.**
 Tully, J. Senr.
- East Retford.**
 Welbury, G.
- Eastwood.**
 Ault, J.
- Edinburgh.**
 Ainslie, W.
 Aitken, J.
 Aitken, R.
 Aitken, W.
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 Anderson, W.
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 Brown, D.
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 Gilmour, W.
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 Linton, R.
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 Macadam, S.
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 MacGlashan, D.
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 Mackenzie, J.
 MacLagan, D.
 Macullum, A.
 Morrison, D.
 Napier, A.
 Nicol, J.
 Niven, W.
 Noble, A.
 Pinkerton, W.
 Purves, S.
 Raimes, R.
 Ritchie, J.
 Robertson, J.
 Sang, E.
 Simpson —
 Smiles, J.
 Smiles, J.
 Smith, A.
 Smith, T.
 Tait, W.
 Taylor, A.
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 Bevans, J.
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 Evans, A.
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 Brown, T.
 Buchanan, J. D.
 Cowan, —
 Currie, J.
 Currie, J.
 Davison, T.
 Dickie, J.
 Dun, R.
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 Frazer, D.
 Fleming, J.
 Greig, W.
 Guthrie, P.
 Halley, A.
 Hamilton, J.
 Harrower, P.
 Jaap, J.
 Johnson, A. E.
 Kennedy, W.
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 Maccall, R. M.
 McKenzie, —
 McDonald, J.
 McGregor, —
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 Murdock, G.
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 Owles, J.
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 Mellin, G.
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 Pearson, E.
 Reynolds, J. J.
 Richardson, G.
 Robbins, J.
 Samuel, J. B.
 Sandford, G. W.
 Savory, J.
 Savory, C. H.
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 Shephard, T. F.
 Shirliff, W.
 Skidmore, J.
 Smith, W.
 Squire, A. H.
 Starling, H. W.
 Stevenson, W.
 Stooke, A.
 Taylor, J.
 Titley, T.
 Trotman, A. C.
 Twemlow, F. E.
 Twinberrow, J. K.
 Verity, R.
 Watts, D. W.
 Watts, J.
 Waugh, A.
 Waugh, G.
 Weaver, E.
 Weston, S. J.
 Westrup, J.
 Whitburn, A. R.
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 Williams, J.
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 Morson, T.
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 Handcock, J.
 Moore, R.
- Oswaldtwistle
 near Accrington.
 Haworth, W.
- Oundle,
 Roper, H. E.
- Oxford.
 Hitchcock, C. A.
 Houghton, T.
 Ince, W.
 Luff, W.
 Paterson, W.
 Taylor, R.
- Paignton.
 Merson, —, junr.
- Painswick, Glou-
 cestershire.
 Savory, H. B.
- Patricroft.
 Bowden, W.
- Pembroke Dock.
 Andrews, C.
- Penrith.
 Kirkbride, W.
 Redfern, T.
 Wilson, J.
- Pensnett, Stafford-
 shire.
 Bache, J.
- Perth.
 Reid, N.
 Wilson, J.
- Peterboro.
 Bright, R.
 Read, H. H.
- Plymouth.
 *Balkwill, A. P.
 Balkwill, G.
 Burdwood, J.
 Elliott, S., junr.
 Furneaux, W. H.
 Gardner, J. R.
 Hearder, H. P.
 Hetherington, A. H.
 Langdon, F. B.
 Lewin, W.
 Luke, R. S.
 Marks, B.
 Snell, C. H.
 Turney, S. B.
- Plymton St. Mau-
 rice, Devon.
 Martin, J.
- Poole.
 Penney, W.
- Portobello.
 Kemp, D.
 Nesbit, J.
- Portsmouth.
 Pasmore, G.
- Prescott.
 Slack, J. L.
- Preston.
 Daggers, F.
 *Houghton, W.
 Mason, H. C.
 Wright, J. A.
- Princes Risboro'
 Bucks.
 Ridley, H.
- Ramsbottom.
 Hedley, T.
 Morton, J.
 Wright, J. A.
- Ramsey.
 Palmer, F. W.
- Ramsgate.
 Morton, H.
- Rawtenstall, Lancs.
 Halstead, H.
 Lord, L.
- Reading.
 Daniel, S.
 Dowling, R.
 Jameson, W. G.
 Welch, C.
- Redditch.
 Harris, J.
- Redhill.
 Padwick, T.
- Rhyl.
 Jones, E. P.
- Richmond, Surrey.
 Clarke, T. M.
- Richmond, Yorks.
 Cockcroft, A.
 Thompson, J. T.
 Thompson, T.
- Riddings, Derby.
 Shaw, A.
- Ringwood.
 Wheaton, W. F.

erby. K.	Saint Andrews. Hartley, W.	Bennett, G. Clayton, W. Cubley, G. A. Dobb, J. T. Ellinor, G. Eyre, S. Gowland, G. R. Gowland, W. Harrison, G. Hill, J. Horncastle, H. Jenkinson, J. H. D. Leslie, J. B. Maleham, H. W. Preston, J. *Radley, W. V. Spavould, E. Wilson, E.
, J. W.	Saint Austell, Corn- wall. Geldard, J.	
, J.	Saint Davids. Hughes, H. M.	
A. a, R. E. H.	Saint Day, Corn- wall. Corfield, O. Corfield, T. J. T.	
H. W.		
ants. V. H.	Saint Helen's, Lan- cashire. *Cotton, J. Hibbert, J. Webster, G.	
North- nd. R. H. B.	Saint Ives. Williams, J. V.	Shepton Mallett. Cottrill, G. J. Fudge, C. W.
a.	Salisbury. *Atkins, S. R. Bennett, T. J. Orochard, E. J. Read, J. Young, W. F.	Sherburn, South Milford, Yorks. Dove, J.
3. (Mexbro') W. A.		Shields (North). Roddam, H. R.
a, A.	Sandback, Che- shire. Clisby, S. Gee, G.	Shields (South). Mays, R. J. J. Noble, J.
B.		Shoeburyness. Coupe, W.
Ierts.	Scarborough. Bland, H. Fowler, W. R. Oldfield, F. Porrett, G. W. *Smart, T. Whitfield, J.	Shrewsbury. Blunt, T. P. Goucher, J.
J. S. , E.		Sidmouth. Chessall, R.
th, S.	Selby. Brooks, F. J. *Colton, T. Cutting, T. J.	Sittingbourne. Gordelier, P. W. G.
, W.		Sleaford. Heald, B.
J. J.	Selkirk. Dunn, J.	Slough. Dawson, W. Griffith, R.
f. F.	Shaldon, near Teignmouth. Rogers, S.	
alden.	Sheerness. Bray, J.	Soham. Floyd, J.
is.	Sheffield. Allen, A. H. Baker, W.	Southampton. Adams, A. A. Bienvenu, J.
. G.		

- Dalgarno, P.
 *Dawson, O. R.
 Randall, W. B.
 Spearing, J.
- Southport.
 *Ashton, W.
 Kershaw, J.
 Sykes, T. H.
- Southsea.
 *Rastwick, J.
 Rogers, W. S.
 Sapp, J. J.
- Sowerby Bridge,
 Yorks.
 Stott, W.
- Spalding.
 Swift, F.
- Spilsby.
 Rainey, E.
- Staincross, near
 Barnsley.
 Holden, A. H.
- Staines.
 Earee, T.
- Stamford.
 Hackett, J. H.
- Stirling,
 McNichol (Alva).
- Stockport,
 Clarke, T.
 Longley, G.
- Stockton-on-Tees.
 *Brayshay, T.
 Brayshay, W. B.
 Knights, J. A.
- Stoke-on-Trent.
 Adams, F.
 *Adams, J. H.
 Fletcher, T.
 Brown, J.
 Wilson, W.
- Stokesley, Yorks.
 Calvert, R.
- Stone, Staffordshire.
 Slater, T.
- Stourbridge.
 Bland, J. A.
 Jones, R. G.
- Stoneycroft.
 Parker, J. E.
- Stornoway.
 Macpherson, A.
- Stowmarket.
 Simpson, A. L.
 Sutton, C. W.
- Stow-on-the-Wold.
 Thornley, C.
- Stratford-on-Avon.
 Kendall, F.
 Wynne, E. P.
- Stroud.
 Coley, S.
 *Pearce, J. A.
 Smith, D.
- Sudbury.
 Harding, J. J.
- Sunderland.
 Burn, T.
 Chapman, T.
 Craig, C.
 Harrison, J.
 Harrison, W. B.
 Nasbit, T.
 Nicholson, J. J.
 Potts, E.
 Priestly, J.
 *Sharpe, D. B.
 Thompson, H.
 Thompson, W.
- Sutton Ashfield.
 Littlefield, S.
- Sutton Coldfield.
 Smith, W.
- Sutton, Surrey.
 Potter, H.
- Swaffham.
 Baker, P. C.
- Swansea.
 Williams, C. H.
- Tamworth.
 Morgan, G.
- Taunton.
 Evans, J. J.
 Gregory, G. H.
- Grose, N. M.
 Hambley, C. J.
 Lindsey, F. C.
 Pearce, J.
 *Prince, H.
- Tavistock.
 Gill, W.
- Teignmouth.
 Carpenter, J. T.
 Cockness —
 Cornelius, R.
- Tenterden.
 Willsheer, S.
- Tetbury.
 Blewett, W. R.
- Tewkesbury.
 *Allis, F.
 Walker, J.
- Thame.
 Davies, J. R.
- Thirsk.
 Manfield, W.
- Thorne near Don-
 caster.
 Knowles, C. W.
- Thrapstone.
 Pars, R. C.
- Tickhill, Yorks-
 Colbeck, —
- Tipton.
 Butler, J., jun.
- Todmorden.
 Buckley, R.
 Lord, C.
 Stevenson, W.
- Torquay.
 Brown, E. W.
 Clarke, R. F.
 Cocks, J. W.
 Glanfield, G.
 Guyer, J. B.
 Hart, C.
 *Header, W.
 Millar, F. C. M.
 Narracott, H.
 Riches, T.
 Smith, E.
 Watson, D.
 West, J.

n.	Walsall.	Weymouth.
rd, E.	Bayley, J. T.	Cole, W. T.
	Bennet, J. H.	Gregory, W.
	Grove, H.	*Groves, T. B.
be, F.	*Hobson, H.	Mason, A.
	Morris, J. O.	Poole, H.
	Sheldon, A.	Walford, R. J.
		Williams, E. V.
l, J.		
erts.	Walton-on-	
G.	Thames.	Whitby.
	Makins, G. H.	Taylor, H.
lge.	Wanstead.	Whitehaven.
d, W. H.	Rayson, H.	Kitchin, A.
ge Wells.	Wargrave.	Wigan.
S.	Soames, W.	Johnson, T.
on, G.	Warminster.	
on, A.	Humby, L. W.	Wilton.
G.	Toone, J. A.	Staples, E.
t. J.		
Staffs.	Warrington.	Wimbledon.
W. P.	Bennett, J.	Melin, J. P.
	*Webster, S. M.	
	Young, J. C.	Winchcome.
ham.		Howman, P.
H. F.	Warwick.	
, H.	Ayre, H. M.	Windsor.
	Baly, J.	Boyce, J. P.
	Williams, J. C.	Collins, H. G.
n, E. B.		Crook, E.
	Wath-on-Dearne.	Grisbrook, E.
l.	Hick, A.	*Russell, C. J. L.
ard, J.	Wednesbury.	Squire, J.
eth, H. W.	Gittoes, S. J.	Weller, G.
am.	Wellington, Salop.	Winsford, Che-
W.	Bates, J.	shire.
		Burgess, R.
	Wells.	
n, J. B.	Manning, R. J.	Woburn.
		Clarke, G. B.
st.	Welwyn.	Woodstock, C.
is, W. H.	Lawrance, E.	
ld.	Westbury.	Wolverhampton.
	Bailey, T.	Bailey, W.
F.	Taylor, S.	*Brevitt, W. Y.
s, T. W.		Dulley, J.
	West Bromwich.	Fleeming, W.
	See Bromwich,	Hamp, J.
Great,	West.	Payne, A.
		Ratcliffe, W.
J.	West Hartlepool.	Scott, W. L.
	Cooper, S. H.	
ford.	Emerson, C.	
S.		Worcester.
E. J.	Weston-super-	Ferneley, C.
	Mare.	George, H.
Kent.	*Gibbons, G.	Moore, S.
R.	Rich, T.	Twinberrow, J.

Vergo, C.	Yeadon.	Proctor, W.
Whitfield, H.	Blatchley, T.	Shann, G.
*Witherington, T.		Tollinton, R. B.
	Yeovil.	Wilson, J. W.
Workington.	Helliar, E.	Wright, F.
Mason, J.	Maggs, T. C.	
	Manning, T. D.	York Town, Farn-
Worksop.		borough Station.
Jones, G. W.	York.	Claypole, A. E.
	Bennett, G.	Addresses Un-
Worthing.	Bulmer, F.	known.
Burt, J.	Cooper, T.	Bowen, W.
	Croskel, C.	Carter, F. G.
Wrexham.	Dresser, R.	Hebb, T.
Edisbury, J. F.	Hayland, W. C.	Levie, A. M.
Francis, J.	Holden, R.	Monkhouse, J.
Paine, C.	Moon, R. P.	Moon, R. P.
Yarmouth. See GREAT	Oglesby, J.	
YARMOUTH.	Parker, T.	

LOCAL ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

- ABERDEEN**.—Society of Chemists and Druggists (1839). C. Davidson, 205, Union Street, Aberdeen.
- ASHTON-UNDER-LYNE**.—Ashton-under-Lyne and Dunkinfield Chemists' Association (1869). E. Fisher, 160, Stamford Street, Ashton-under-Lyne.
- BATH**.—Chemists' Association (1864). R. O. Harding, Belvedere, Bath.
- BIRMINGHAM**.—Midland Counties Chemists' Association (1869). W. J. Lucas, Colemore Row, Birmingham. Chemists' Assistants' Association (1868). F. G. Homer, Birmingham.
- BRADFORD**.—Chemists' Association. H. G. Rogerson, Bradford.
- BRISTOL**.—Pharmaceutical Association (re-established 1869). G. F. Schacht, 7, Regent Place, Clifton, near Bristol.
- COLCHESTER**.—Association of Chemists and Druggists (1845). J. L. Chaplin, 124, High Street, Colchester.
- DUNDEE**.—Chemists and Druggists' Association.
- EDINBURGH**.—The North British Branch of the Pharmaceutical Society of Great Britain. John Mackay, F.C.S., 119, George Street, Edinburgh.
- EXETER**.—Exeter Pharmaceutical Society (1845). R. Walton, 246, High Street, Exeter.
- GLASGOW**.—Chemists and Druggists' Mutual Improvement Association (1854).
- GOSPORT**.—Y. L. Strachan, High Street, Gosport.
- HALIFAX**.—Halifax and District Chemists and Druggists' Association (1868). W. C. Hebden, 64, North Gate, Halifax.
- HULL**.—Chemists' Association (1868). C. B. Bell, 6, Spring Bank, Hull.
- LEEDS**.—Chemists' Association (1862). E. Yewdall, 40, Wade Lane, Leeds.
- LEICESTER**.—Chemists' Assistants and Apprentices' Association (1869). S. H. Cadoux, care of Mr. Parsons, 20, Gallowtree Gate, Leicester.
- LIVERPOOL**.—Chemists' Association (1868). E. Davies, F.C.S., Royal Institution, Colquitt Street, Liverpool.
- MANCHESTER**.—Chemists and Druggists' Association. F. B. Bengier, 1, Market Place, Manchester.
- NEWCASTLE-ON-TYNE**.—University of Durham.
- NORTH STAFFORDSHIRE**.—Chemists' Association. W. Wilson, 21, High Street, Hanley, Staffordshire.
- NOTTINGHAM**.—Nottingham and Notts Chemists' Association. J. T. Mayfield, High Street, Nottingham.
- PLYMOUTH**.—Association of Chemists for Plymouth, Devonport and Stonehouse. G. Breeze, Catherine Street, Devonport.
- SCARBOROUGH**.—Chemists' Association (1870). J. Whitfield, F.C.S., 18, Westbro' Scarborough.
- SHEFFIELD**.—Pharmaceutical and Chemical Association. H. W. Maleham, 7, Westbar, Sheffield.
- SUNDERLAND**.—Chemists' Association. J. J. Nicholson, 226, High Street, West, Sunderland.
- TAUNTON**.—Chemists' Association (1870). H. Prince, Fore Street, Taunton.
- YORK**.—Chemists' Association. T. P. Bulmer, Low Ousegate, York.

PRESENTATION COPIES of THE YEAR-BOOK OF PHARMACY are
forwarded to the following ;—

The Honorary Members.

Libraries.

Pharmaceutical Society of Great Britain.
Chemical Society of London.
Royal Society of London.
American Pharmaceutical Association.
Société de Pharmacie, Paris
Ecole de Pharmacie, Montpellier.

Journals.

Pharmaceutical Journal.
Chemist and Druggist.
Chemical News.
Lancet.
Medical Times and Gazette.
British Medical Journal.
Medical Press and Circular.
American Journal of Pharmacy.
The Chicago Pharmacist.

PROVINCIAL ASSOCIATIONS.

SECRETARIES.

Aberdeen Society of Chemists and Druggists	Mr. C. Davidson, 205, Union Street, Aberdeen.
Bath Chemists' Association	Mr. R. O. Harding, 27½, Belvedere, Bath.
Colchester Association of Chemists and Druggists	Mr. J. L. Chaplin, 124, High Street, Colchester.
Exeter Pharmaceutical Society	Mr. R. Walton, 246, High Street, Exeter.
Hull Chemists' Association	Mr. C. B. Bell, Spring Bank, Hull.
Leeds Chemists' Association	Mr. E. Yewdall, 40, Wade Lane, Leeds.
Leicester Chemists' Assistants and Apprentices' Association	Mr. S. H. Cadoux, 20, Gallowtree Gate, Leicester.
Liverpool Chemists' Association	Mr. A. H. Mason, 313, Upper Parliament Street, Liverpool.
Manchester Chemists and Druggists' Association	Mr. F. B. Bengier, 1, Market Street, Manchester.
Midland Counties Chemists' Association	Mr. J. Lucas, 24, Quadrant, New Birmingham.
Nottingham and Notts Chemists' Association	Mr. J. T. Mayfield, High Street, Nottingham.
North British Branch of the Pharmaceutical Society	Mr. J. Mackay, 119, George Street, Edinburgh.
North Staffordshire Chemists' Association	Mr. W. Wilson, 21, High Street, Staffs.
Sheffield Pharmaceutical and Chemical Association	Mr. H. W. Maleham, 7, Westfield.
Sunderland Chemists' Association	Mr. J. J. Nicholson, 226, West, Sunderland.

PROGRAMME OF PROCEEDINGS
OF THE
BRITISH PHARMACEUTICAL CONFERENCE,
AT THE
EIGHTH ANNUAL MEETING, EDINBURGH,
1871.

OFFICERS FOR 1870-71.

President.

W. W. STODDART, F.C.S., F.G.S., Bristol.

Vice-Presidents.

Who have filled the Office of President.

H. DEANE, F.L.S., Clapham Common, S.W.
PROF. BENTLEY, F.L.S., M.R.C.S., 17, Bloomsbury Square, W.C.
D. HANBURY, F.R.S., F.L.S., Clapham Common, London, S.W.

Vice-Presidents.

J. ABRAHAM, Liverpool.	J. INCE, F.L.S., F.C.S., London.
H. C. BAILDON, Edinburgh	J. WILLIAMS, F.C.S., London.

Treasurer.

GEORGE F. SCHACHT, Clifton, Bristol.

General Secretaries.

PROF. ATTFIELD, Ph.D., F.C.S., 17, Bloomsbury Square, W.C.
R. REYNOLDS, F.C.S., 13, Briggate, Leeds.

Assistant Secretary.

JAMES COLLINS, F.B.S.E.

Local Secretary.

JOHN MACKAY, F.C.S.

Editor of the Year-Book.

C. H. WOOD, F.C.S.

Editors of the Transactions.

THE SECRETARIES.

Other Members of the Executive Committee—1870-71.

B. BRUNGER, Manchester.	M. CARTWRIGHT, F.C.S., London.	W. MARTINDALE, F.C.S., London.
BLANSHARD, Edinburgh.	E. DAVIES, F.C.S., Liverpool.	
B. BRADY, F.L.S., Newcastle-on-Tyne.	T. B. GROVES, F.C.S., Weymouth.	H. MATTHEWS, F.C.S., London.
		F. SUTTON, F.C.S., Norwich.

Auditors.

H. S. EVANS, F.C.S. ; J. F. ROBINSON.

Local Committee for Edinburgh.

C. BAILDON, <i>Chairman.</i>	T. FAIRGRIEVE.	J. NICOL.
BLANSHARD, <i>Vice-Chairman.</i>	W. GILMOIR.	J. NESSBIT.
AINSLIE, } <i>Treasurers.</i>	J. GARDNER.	R. RAINES.
L. YOUNG, }	D. KEMP.	J. ROBERTSON.
MACKAY, F.C.S., <i>Secretary.</i>	G. H. LAIRD.	T. SMITH.
ATKIN.	J. MACKENZIE.	J. SIMPSON.
R. BROWN.	S. MACADAM, Ph.D., F.R.S.E.	W. TAIT.
FIMLAYSON.	A. NAPIER.	

The sittings of the Conference were held in the Craigie Hall, 5, St. Andrew's Square, on Tuesday and Wednesday, August 1st and 2nd, commencing at 10 a.m. each day.

The Reception Room, where Members and Visitors might assemble, write letters, and obtain programmes and other information, was at Craigie Hall, 5, St. Andrew Square.

Monday, July 31st.

The EXECUTIVE COMMITTEE met according to notices from the Secretaries.

Tuesday, August 1st.

The CONFERENCE met at 10 o'clock a.m., adjourning at 12.30 p.m.; and at 2 o'clock p.m., adjourning at 4.30 p.m.

Order of Business:

- Reception of Delegates.
- Place of Meeting for 1872.
- Election of Members.
- Report of Executive Committee and Financial Statement.
- Introductory Address by the President.

PAPERS.

1. *Oxidation Products of Essential Oil of Orange-Peel.* Professor WRIGHT, D.Sc.
 2. *New Derivatives from Codeia.* Professor WRIGHT, D.Sc.
 3. *Report on the Chloral of Trade.* A. H. MASON, F.C.S.
 4. *On Chloral Hydrate.* By M. M. PATTISON MUIR, F.C.S.
 5. *Pharmaceutical Notes on Rhamnus frangula, Linn.* Mr. H. C. BALDWIN.
 6. *The Compound Iron Mixture of the British Pharmacopæia.* Mr. C. A. STAPLES.
 7. *Report on the Purity of the Permanganate of Potassium of Pharmacy.* Professor ALLEN, F.C.S.
 8. *On the Use of Blistering Flies in Hydrophobia.* HENRY GROVES, F.R.C.S.
 9. *Solutions.* T. B. GROVES, F.C.S.
 10. *A New Method for the Preservation of Meat.* Dr. PAUL, F.C.S.
- The Executive Committee met at 4.30 p.m. in the Craigie Hall.

The CONVERSAZIONE, given by the Chairman and the Local Committee in Edinburgh was held in the Museum of Science and Art, on the evening of Tuesday, 1st August, at 8 o'clock.

Wednesday, August 2nd.

The CONFERENCE met at 10 o'clock a.m., adjourning from 12.30 p.m. till 2 o'clock p.m. The whole of the business of the Conference was completed this day 1.30 p.m.

Order of Business:

Election of Members.

Reception of Delegates.

PERS.

1. *Crystalline Principles in Aloes.* Professor FLÜCKIGER, M.D., Bern.
2. *Notes on Aloes.* Messrs. T. and H. SMITH.
3. *Linseed and Linseed Meal.* THOMAS GREENISH, F.C.S.
4. *The Tincture-Press.* Mr. C. A. STAPLES.
5. *Wild Rue—Semen harnalæ.* Professor FLÜCKIGER, M.D., Bern.
6. *A Method of obtaining Distilled Water economically.* Mr. C. A. STAPLES.
7. *Pharmaceutical Ethics—Apprenticeship.* Mr. R. S. ATKINS.
8. *Preparation of Liquor Bismuthi.* C. H. WOOD, F.C.S.
9. *Pharmacopœial Nomenclature.* By C. R. C. TICHBOURNE, F.C.S.

Election of Officers for 1871-72.

ON THURSDAY EVENING, 3rd August, at 7 o'clock, a DINNER was given at GREGOR'S ROYAL HOTEL, 53, Princes Street, by the Resident Members, to the President and Officers of the Conference.

The fourth page of the Programme the Local Committee added the following useful information for strangers.

PLACES OF INTEREST IN EDINBURGH.

ARCADE'S SEAT (822 feet high) and Salisbury Crags.

ARCADE, Deaf and Dumb, Henderson Row, foot of Pitt Street.

ARCADE HILL—Magnificent view of Edinburgh and Firth of Forth.

ARCADE, THE—Mons Meg, the Armoury, Queen Mary's Apartment, etc.—Free.

Regalia of Scotland, 12 noon to 3 p.m.—Free.

ARCADE, St. Giles', High Street—Free.

ARCADES—Dean, Queensferry Road, north-west of the City, where are interred Lords Jeffrey, Rutherford, Cunninghame, Moncreiff, and Cockburn; Professors Forbes, Menzies, and Wilson; Sir W. Allan, etc. *Dalry*, West-end. *Grange*, south from Meadows, contains the remains of Rev. Dr. Chalmers, Sir Andrew Agnew, Mrs. Johnstone, Hugh Miller, Robert Flockhart. *Southern*, Dalkeith Road. *Rosebank*, Pirig Street. *Warriston*, Inverleith Row.

COLLEGE, THE, South Bridge; *Free Church College*, Head of Mound.

CRAIGMILLAR CASTLE, Ruins of.

GALLERY, NATIONAL—Free on Mondays, Tuesdays, Wednesdays, and Saturdays other days, 6d.

GALLERY, STATUE—*Royal Institution*, Wednesdays and Fridays, 10 to 4—6d.

GARDENS, ROYAL BOTANIC, Inverleith Row—Free.

GYMNASIUM, Royal Crescent Park—6d.

HOSPITALS—*Donaldson's*, Tuesday and Friday, 2.30 to 5—Order from Treasurer, 61, Castle Street; *Heriot's*, Lauriston, 12 to 3, except Saturdays—Order from 11, Royal Exchange.

JOHN KNOX'S HOUSE, High Street, Netherbow—Wednesdays and Saturdays, 10 to 4—6d.

LIBRARIES—*Advocates'*, Parliament Square—Free; *Signet*, Parliament Square—Order from a Member; *College*, South Bridge—6d., party of 12 and under, 1s.

MONUMENTS—Scott (top, 2d.), Wilson and Ramsay, Princes Street; Burns (top, 2d.), Nelson (top, 3d.), Playfair, Dugald Stewart, Martyrs', and National, on Calton Hill; Duke of Wellington, front of Register Office; Melville, Melville Street; Melville and Earl of Hopetoun, St. Andrew Square; George IV. and Pitt, George Street; Charles II., Parliament Square; Duke of York and 78th Highlanders, Castle Esplanade, etc.

MUSEUMS—*Antiquarian*, Royal Institution, Thursday and Friday—6d.; Tuesday, Wednesday, and Saturday—Free.

Industrial (Science and Art), Argyle Square—Wednesday, Friday, and Saturday—Free; other days, 6d.

National, Mound—Tuesday, Wednesday, and Saturday—Free; Thursday and Friday, 6d.

Phrenological, High School Yards—Free.

Surgeons', Nicholson Street—Daily, except Tuesday—Free.

OBSERVATORIES—*The Royal*, Calton Hill; *Short's*, Castle Hill, 1s.

PALACE and CHAPEL of HOLYROOD—Saturday—Free; other days, 6d.; *Dalkeith Palace and Gardens*, Wednesdays and Saturdays—Free.

PARKS, The Queen's, foot of Canongate; *Gardens*, Princes Street.

PARLIAMENT HOUSE, Parliament Square—Free.

POST-OFFICE and INLAND REVENUE OFFICE, foot of North Bridge

REGISTER HOUSE, Princes Street, 10 to 3; Saturdays, 10 to 12—Free.

ROSLYN CHAPEL and CASTLE, and HAWTHORNDEN—Total, 2s. 6d.

STATUARY, Forrest's, Royal Crescent Park—1s.; Saturdays, 6d.

THEATRE, Royal, Head of Leith Walk; *Royal Princess'*, Nicolson Street.

VICTORIA HALL, Castle Hill—where the General Assembly meets.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT EDINBURGH, 1871.

On Tuesday, August the 1st, the Meetings of the British Pharmaceutical Conference commenced in the Craigie Hall, No. 5, St. Andrew's Square, Edinburgh, under the presidency of W. W. Stoddart, F.C.S., F.G.S.

The PRESIDENT, in opening the proceedings, said,—Gentlemen, we will now commence the business we have before us; and in doing so I would first ask those who are present who may be Delegates to report themselves. The Associations in different parts of the country are doing good work; and we desire, in our own, as well as their interests, to give their Delegates due prominence.

DELEGATES.

The following gentlemen, who attended as Delegates from various Societies, gave in their names:—

Brighton.—Mr. Savage and Mr. Schweitzer.

Bristol.—Mr. Schacht and Mr. Stoddart.

Liverpool.—Dr. Edwards (also delegate from the Pharmaceutical Association of the Province of Quebec), Mr. Shaw, and Mr. Mason.

Hull.—Mr. Bell and Mr. Myers.

Manchester.—Mr. B. Bengier.

Glasgow.—Mr. Fraser, Mr. Davidson, Mr. Kinnimont, and Mr. Fairlie.

When the delegate from Quebec entered the room, at a later hour, he was received with applause.

The PRESIDENT said he wished to express the satisfaction he had of seeing Dr. Edwards present.

Dr. EDWARDS said it gave him pleasure to be among so many friends; and, in speaking of the Pharmaceutical Society of Quebec, said it had some privileges which he might have an opportunity of referring to by-and-by.

THE MEETING IN 1872.

Mr. SCHWEITZER said: Mr. Savage and I have been deputed by the Brighton chemists to offer the Conference a hearty invitation to

that town as its next place of meeting, and to state on behalf of the chemists there that they will do their very best to enable you to spend a happy time.

The PRESIDENT: It is only necessary for me to say, after the kind invitation which Mr. Schweitzer has brought us, and knowing that the British Association will meet at Brighton next year, that we shall be glad to hold our Conference in that town. Is it your pleasure that we accept the kind invitation?

It was unanimously agreed to accept the invitation.*

NEW MEMBERS.

The PRESIDENT: The next business would be the enrolment of candidates; but I have to state that, in order to save time, the Committee, at a meeting last night, accomplished this task, electing sixty-four new members.

HONORARY MEMBERS.

The PRESIDENT said: I think that now is the proper time to elect the honorary members. There are two gentlemen whose names the Executive Committee desire to recommend, and who are very well known. I mean Prof. Maisch, America, and Dr. De Vrij, the Hague. We shall be highly honoured to have their names on the list. I therefore propose that they be added.

The motion was agreed to.

ANNUAL REPORT.

Professor ATTFIELD (one of the General Secretaries) read the Annual Report of the Committee, as follows:—

The President and Executive Committee once more have to report to the members of the British Pharmaceutical Conference, that during the past year the Association has largely increased in numbers, usefulness, and general prosperity. Nineteen hundred names are on our books, each member has been presented with a copy of the Year-Book, and the Treasurer's statement shows a balance in hand of fifty pounds.

Meetings of the Executive Committee.—During the past year your Committee has held six meetings.

On October 5th, 1870, after some matters of detail relating to the Liverpool Meeting had been disposed of, a formal vote of thanks was conveyed to the Chairman, Secretary, and other members of the

* The meeting will commence on Tuesday, August 18th, at 10 a.m.

Liverpool Local Committee, for the judicious, liberal, and successful manner in which they had advanced the objects of the Conference. Mr. James Collins was then appointed to give evening assistance to the Metropolitan Secretary, in keeping the books of the Conference, issuing circulars, and acknowledging subscriptions; the post being made tenable for one year at a salary of twenty-five pounds. Messrs. Carteighe, Groves, Hanbury, Ince, and Stoddart, with Professor Attfield as Secretary, were re-appointed a Committee to superintend the publication of the Year-Book of Pharmacy. At this meeting eleven candidates were elected to membership.

On December 7th, 1870, two long reports of business transacted by the Year-Book Committee, on October 19th and 20th, were read, discussed, and adopted. The continued illness of Mr. Brough had rendered imperative the appointment, by this Sub-committee, of a joint-editor, an office which Mr. Joseph Ince had, after some persuasion, consented to accept. The Executive confirmed the action of the Sub-committee. Arrangements were then made for the distribution of the Year-Book to members. Ten gentlemen were elected to membership.

On February 1st, 1871, the labours of Local Treasurers and the courtesy of London merchants, in conveying parcels of the Year-Book gratuitously, were duly recognised and recorded. Plans for obtaining an increased number of members, with the view of securing sufficient funds to continue the publication of the Year-Book, were introduced by the Secretary, and fully discussed. At a previous meeting the Executive Committee had accepted, with much regret, the resignation of Mr. John Cargill Brough, as editor of the Year-Book. The sad state of Mr. Brough's health rendering any resumption of editorial work impossible, invitations to apply for the appointment had been issued, and responded to by three gentlemen. After due deliberation, the Committee elected Mr. Charles H. Wood, F.C.S., to the vacant post. Mr. Daniel Hanbury, F.R.S., and Professor Attfield were requested to revise the list of gentlemen, societies, and journals receiving presentation copies of the publications of the Conference. The financial position of the Conference was considered at this meeting. The following proposition was carried unanimously:—"That the cordial thanks of the Executive Committee be conveyed to Mr. Joseph Ince for his valuable services in editing, at a very brief notice and at much personal inconvenience, the 'Year-Book of Pharmacy for 1870.'" Fifty-three candidates were elected to membership.

On May 16th, 1871, the London Secretary reported on the distri-

bution of the Year-Book, described the difficulty, labour, and expense connected therewith, and proposed that in future the volume should be sent by post direct from the printers to each member who had paid the annual subscription (5*s.*) and sixpence in addition for postage (total, 5*s.* 6*d.*). The Committee instructed the Secretaries to carry out this plan during the succeeding year. The Secretaries were empowered to issue a new form of nomination and a new specimen page of the Year-Book. The estimates of Messrs. Butler and Tanner for printing, and Messrs. J. and A. Churchill for publishing a second Year-Book, on terms similar to those under which that for 1870 was produced, were accepted. The Report of the Sub-committee on presentation copies of the Year-Book having been read and adopted, a resolution was passed, "That a copy of the Year-Book shall be offered to each Provincial Pharmaceutical Association having a library." A list of subjects suggested for research was laid before the Committee, and Messrs. Williams, Groves, and Attfield appointed to revise the same before its distribution to members. Eighty-one gentlemen were elected to membership.

On July 5th, 1871, the Secretaries reported, that since the previous meeting of the Committee the following documents had been posted to each of the 1900 members:—(a) the list of subjects suggested for research, together with (b) two nomination papers, (c) a specimen page of the Year-Book, and (d) a letter requesting members to obtain candidates for election; another letter (e) and other invitation papers had been sent to four or five hundred gentlemen likely to join the Conference. The Annual Circular (f) relating to the General Meeting for 1871, and an enclosure (on behalf of the Edinburgh Local Committee) of (g), a card of invitation to a *Conversazione* have also recently been forwarded. The Report of the Year-Book Committee, relating more especially to the arrangement of matter in the Year-Book, was received and adopted. At this meeting of the Committee 148 gentlemen were elected members.

Finally, on July 31st, your Committee met in Edinburgh, to arrange business for the present meeting, and to elect 64 members.

Number of Members.—It will thus be seen that, as a result of the labours of your Committee, the efforts of Local Secretaries, and the kindness of individual members, about 300 new names have been added to our roll since we assembled last autumn. The total number of members is now 1917. From these figures, however, there must be deducted, losses by death, 8; resignations, 14; untraced removals, 6; and members whose subscriptions are more than two years in arrear, 11; total 39. This gives an effective strength

1878. The Executive Committee congratulates the Conference at this high number, but would urge on every member the importance of using his utmost efforts in obtaining recruits. The production of Year-Books, without intermission, can only be secured by the united contributions of at least 2000 members. A much larger number than this may fairly be anticipated as the objects of the Conference become more widely known and more fully appreciated.

Amongst those whom death has taken from us there occur the following:—Mr. Gissing, of Wakefield, whose name is appended to the original circular inviting gentlemen to join the Conference convened about to be inaugurated at Newcastle-on-Tyne in 1863; Mr. Mack, of Oxford, five of whose papers appear in our Transactions:

“Mistura Creosoti;” 2, “Iodo-hydrargyride of Potassium, and the Oxidation Tests for Methylic Alcohol;” 3, “Test for Methylic Alcohol when mixed with Ethylic Alcohol;” 4, “Detection of Methylic Alcohol in Chloroform, Ether, Sweet Spirit of Nitre, and Sal volatile;” and 5, “On Eschwege’s Patent Wood Spirit;” and Dr. Quiller, of London, a name well known in pharmacy.

The Bell and Hills Fund.—A second grant of ten guineas’ worth of books has been made by your Committee in accordance with the intentions of the benevolent founder Mr. Thomas Hyde Hills. Fourteen appropriately-bound volumes of recent works, not already in their library, were presented to the Liverpool Chemists’ Association, and duly acknowledged. A similar present will be offered to the library of the North British Branch of the Pharmaceutical Society.

The Year-Book of Pharmacy for 1871, the second issued, is in forward state; indeed the Editor has laid on the table the manuscript of the work. As soon as the proceedings of the present meeting can be reported, the whole of the volume will be placed in the hands of the printers; and, when published, a copy forwarded by post to members.

The Financial Position of the Conference.—Lastly, your Committee would draw attention to the Treasurer’s statement of accounts. Every liability for the eighth Conference year—July 1st, 1870, to July 1st, 1871—has been discharged, and there is a balance in hand of £50. This sum is less by £40 than that remaining at the end of last year, but several exceptional expenses have been incurred, hence your Committee hopes that the income of the present year will meet the expenditure; a result that will certainly ensue if members will kindly obtain additional subscribers.

The Treasurer in Account with the British Pharmaceutical Conference, 1870-71.

<i>Dr.</i>		<i>£</i>	<i>s.</i>	<i>d.</i>
To cash in hand, July 1st, 1871		96	10	9
„ Sale of Year-Books		11	10	0
„ Advertisements in Year-Book		58	1	0
„ Members' Subscriptions		401	11	11
		<hr/>		
		£567	13	8

Cr.

By cost of 2000 Year-Books:—									
Editing, Mr. Brough, (balance of £50)	£	s.	d.	£	s.	d.	£	s.	d.
„ Mr. Ince	15	0	0						
	50	0	0				65	0	0
<hr/>									
Printing and Binding, Messrs. Butler & Tanner				296	0	0			
Woodcuts				1	10	0			
Publishing, J. & A. Churchill:—									
25 per cent. Commission on Advertisements				14	10	3			
Advertising				2	2	0			
Addressing and Wrapping				6	18	6			
Delivering 1100 Year-Books for enclosure				9	3	4			
Postage and Booking				2	1	6			
Postage and Booking by Secretary				10	0	0			
				<hr/>			407	5	7
„ General Printing:—									
Taylor & Co.				18	13	0			
Butler & Tanner				12	8	6			
Marples				5	7	0			
Sheldon				1	10	0			
				<hr/>			37	18	6
„ Advertising							0	10	0
„ Stationery							2	2	11
„ Addressing Circulars							10	4	0
„ Salary to Assistant Secretary (3 yrs.)							18	15	0
„ Postages and Telegrams							33	7	5
„ Post-office Charge for Cashing Stamps							3	4	3
„ Various Petty Expenses							4	6	0
„ Balance in hand							50	0	0
				<hr/>			£567 13 8		

1871.	£	s.	d.
July 1st, Balance in hand	50	0	0
Estimated Arrears of Subscriptions up to June 30th, 1871	20	0	0
	<hr/>		
	£70	0	0

Copies of Year-Book of 1870 in Stock, 200.

Bell and Hills Library Fund, 1870-71.

	£	s.	d.
To Cash in hand	42	0	0
By Books forwarded to Liverpool.	10	10	0
	<hr/>		
Balance in hand	£31	10	0

Examined and found correct,

H. S. EVANS, *London.*J. F. ROBINSON, *Liverpool.*

Mr. AINSLIE (Edinburgh) said: I have much pleasure in moving that the Report be adopted. It must be very satisfactory to those gentlemen who have originated this Conference, to find that its affairs are in such a flourishing condition. * There have been a great many additional new members this year; and I trust that in the year that is coming we shall have a much larger number, so that the Year-Book of Pharmacy may be published without loss. I hope that the number which Dr. Attfield has intimated—2000—will be made up before the next Conference. I think it is a very great advantage to us to have that book on our library tables.

Mr. FRASER (Glasgow) said: I have much pleasure in seconding the adoption of the Report. The sum of 5*s.* paid by each member seems to be a very small sum. I think it might be raised to 7*s.* 6*d.* Five shillings is a very small sum for which to secure the advantages offered by the Conference.

Dr. ATTFIELD: There will be no difficulty in raising enough money, if we get more members. It only requires an effort. I have never asked any one to become a member who has ever refused to do so; on the contrary, I have been thanked by gentlemen whom I have informed that they would get a book so full of matter specially interesting to them for so low a sum. In my opinion, the question of raising the subscription need not be entertained.

The Report was unanimously agreed to. The President then spoke as follows.

THE PRESIDENT'S ADDRESS.

Gentlemen,—The continued success of our Conference is a great cause for congratulation. Since our last meeting in Liverpool, when we had so large an accession of new members, we have to report a further increase of 300, making a present total of about 1900.

On thinking this over, one cannot help exclaiming, what a large amount of good ought to proceed from such an army of workers, if they have (as I hope they have) the welfare of pharmacy at heart!

It surely must be impossible that any single member can remain indifferent to an acceptance of the great chance now offered to us, of improving the position, if not of ourselves, at any rate of our children and successors. I feel confident that most of us, if not all, will be persevering and steadfast in endeavouring to secure a solidity, an honourable value to the title of pharmacist, by combining a good scientific training with a sound practical knowledge.

I feel sure that my words will find an echo in the hearts of those who now bid us so hearty a welcome. We have been striving to cultivate the wish for advancement in many parts of England, and now for the second time we thus try to repay the warmhearted hospitality that we all know fills the breast of every true Scotchman. In the words of one of their own favourite poets I would say,—

“When death’s dark stream I ferry o’er,
A time that surely shall come;
In heaven itself, I’ll ask no more,
Than just a Highland welcome.”

We are now sojourning in the land that produced such men as Thompson, Brewster, Murchison, Miller, Clyde, Leslie, Adam Smith, James Watts, Livingstone, Scott, Burns, and “John Mackay.”

Pharmacy, in its true bearing, is one of the many offshoots of a scientific education, and cannot be properly cultivated and pursued without a fair acquaintance with several branches of natural science. Botany is, doubtless, an important study, yet chemistry must ever be our chief ally. We may accurately describe the characters of the Asiatic poppy, or the Peruvian cinchona, and yet be sadly at a loss if we knew not how to extract the morphia and quinia. All arts and manufactures are dependent on properly carrying out chemical principle. The miner would know nothing of the riches locked up in the solid rock if it were not for chemistry. Astronomy and microscopy would be an empty idea if the chemist had not prepared the appropriate glass for the lenses, or the alloy for their support. If this be true, how much more is the preparation of medicines dependent on chemical processes! How is it that so many of our extracts, infusions, and syrups are inert, while the plants from which they are prepared are so powerful, and poisonous in their action on the animal economy? Why so many prescriptions oftentimes rendered valueless? Surely because the medicines have been rudely prepared, or, as not unfrequently happens, the prescriber brings together in the prescription substances that ought to be kept as widely apart as the poison cupboard and the retail department.

Those four wonderful elements, of which all organized bodies are composed, must be carefully tended and watched, and their several likes and dislikes known, before the pharmacist can elaborate the various medicamenta in their most perfect forms.

Those extraordinary glucosides, alkaloids, and hydrocarbons that fill our shelves, as truly point to the Divine originator of all as do the mental and bodily powers of the man who measures and weighs, or the memory which gives him an experience whereby he can discriminate between the good and the bad, or the useful from the useless. In short, it is Nature, the visible agent of a munificent Creator that we must obey, and on her we are entirely dependent either in the field or in the laboratory. The labours of Dumas, Liebig, Frankland, Richardson, Hofman, Odling, Williamson, Miller, and a host of others, have brought to light by their experiments an array of facts so vast, that probably no one mind can grasp them all. We need only mention the compounds of ethyl, methyl, and amyl, the chloral, pepsine, and chloroform, to instantly call to mind what chemistry has done to alleviate the long list of "ills that flesh is heir to."

Oxygen, in its ordinary condition, and without the aid of moisture and heat, could not destroy the pestilent gases and organisms that abound in our crowded streets and courts; but, in its allotropic form, no sooner does it come in contact with the deadly impurities from our lungs and skin, or the emanations arising from our unnatural mode of living, than it immediately attacks the evil by destroying its very constitution, and prevents its poisonous influence on our health and comfort.

Can it be right, therefore, that so many of us should be from day to day in the midst of the various ozone-producing agents and recommending their use, and yet all the while not caring to know the why and the wherefore of their friendly reactions?

This remnant of the dark ages of our pharmaceutical existence I fervently hope is, or soon will be, a thing of the past, and that our successors will make a better use of the advantages that science offers than their forerunners have.

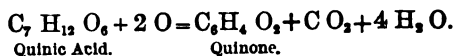
To profitably carry on our businesses we must copy Nature in all her operations. As in hers so in our own laboratories, nothing should be lost and nothing wasted. The pharmacist should strive as strictly to account for every atom or molecule in his transformations or substitutions as for the £ s. d. in his cashbook. Like all other callings, our own has arrived at its present state by very slow degrees; its foundation was laid on the alchemy of the

Arabians and the empiricism of the Greeks. Its superstructure was built up *stratum super stratum* by the persevering study and steady observation of the inhabitants of Great Britain, France, and Germany; while our American brethren have made a good start, and with their characteristic zeal have shown, by their various publications, a practical acquaintance with pharmaceutical operations. Let us, therefore, look after our laurels, and let it not be said by our children and theirs, that *we* have delayed our march on the high road to knowledge. I cannot look around me at the present moment without the proud conviction that we have an earnest band of inquirers, who have met together at this our annual gathering for the purpose of receiving and imparting the results of their experience and observation. Variety is a common natural ordinance, quite as much so in ourselves as in the flowers of the field. The cry of "equality" which we sometimes hear, is a fatal delusion and the dream of a lunatic. We each must humbly play our own peculiar part in one harmonious whole. *Non omnes omnia possumus.*

Perhaps of all the discoveries which modern chemistry has introduced, the most marvellous are the methods of analysis and synthesis of the organic bases. It is true that we cannot produce in our laboratories the root of the madder or valerian, the sugar-cane or the Tonquin bean, but we can manufacture alizarine, valerianic acid, sugar, and coumarin. No more startling proof of the advancement of synthetical chemistry can be adduced than the discovery alluded to by Mr. Perkin at the last meeting of the British Association, in his paper on the artificial preparation of alizarine.

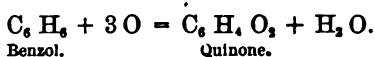
Who could have supposed that there was the least relationship between two such dissimilar bodies as cinchona bark and gas tar; nay, more, that they should give rise to the same substance? Yet so it seems to be. You are, of course, all aware that the cinchona bark contains the alkaloids in combination with quinic acid ($C_7 H_{12} O_6$), which is also found in the coffee, bilberry, holly, privet, oak, ash, elm, and many other plants.

Thirty-three years ago Woskresensky, while experimenting on quinic acid, found that when it underwent oxidation, a peculiar yellow crystalline substance was the result, and to which he gave the name quinone ($C_6 H_4 O_2$).



For many years the atomic constitution of quinone remained a disputed question, till the researches of Graebe showed that it was

a substitution product from benzol, in which two atoms of hydrogen were replaced by two of oxygen.

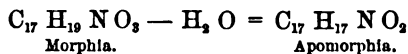


In 1869 Messrs. Graebe and Liebermann found out that from a compound of anthracene and quinine, both of which are present in coal-tar, was formed anthra-quinonic acid, better known as alizarine. It is the first instance of a vegetable colouring matter being produced by artificial means.

An equally strange discovery has been made by Mr. Broughton, the Government quinologist, who has extracted carbolic acid from the *Andromeda Leschenaultii*, a plant growing freely on the Neilgherry Hills. It is said to be of far greater purity than that made from coal tar, but probably the cost of production will prevent its coming into general use.

Since we last met, pharmaceutical chemistry has lost an able investigator by the lamented death of Augustus Matthiessen, who, in conjunction with Messrs. Foster and Wright, was making a very considerable addition to our knowledge of the constitution of the opium alkaloids. For many years past these have been a complete puzzle, and never till now had we any light thrown upon the reason why the poppy capsule should contain such a surprisingly long list of different principles. Happily the experiments on the substitution products of morphia and codeia are being continued by Mr. Wright, who is assiduously working out the subject.

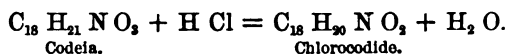
When either of these bases is treated with hydrochloric acid under pressure, an entirely new base is produced, called by its discoverer apomorphia ($\text{C}_{17}\text{H}_{17}\text{NO}_2$), and although it only chemically differs from morphia by the extraction of the elements of water, it has the most opposite properties.



Apomorphia is remarkable for its powerful emetic qualities and unstable nature. The chloride, which is the salt most commonly used, is white and crystalline. Its freedom from all irritant properties renders it a valuable hypodermic agent. Only $\frac{1}{10}$ of a grain by the mouth or $\frac{1}{100}$ by subcutaneous injection acts with greater rapidity than any other emetic; indeed, it is the only one capable of being administered hypodermically.

When codeia is acted upon under pressure by an excess of

hydrochloric acid, a new base is separated, which the discoverers, Messrs. Matthiessen and Wright, called chlorocodide ($C_{18}H_{20}NO_3$).

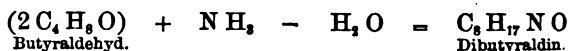


A further reaction then takes place, and the chlorocodide splits up into methyl chloride and apomorphia.



So that the curious fact appeared that codeia only differed from morphia by containing one equivalent more of methyl. Although, however, they obtained apomorphia from codeia, they were unable to reconvert apomorphia into morphia, and thus form morphia directly from codeia.

Dr. Hugo Schiff, of Florence, has announced that he has succeeded in artificially producing conia, the active principle in *Conium maculatum*. He says that when butyraldehyd is acted upon by alcoholic ammonia, dibutyraldin is formed.



By the dry distillation of the latter, conia, among other products, is eliminated, and may at once be recognised by its peculiar odour.



Mr. D. Howard has described a new cinchona alkaloid, which he detected by noticing an unusual loss when recrystallising quinia. The new base is still under investigation, but seems to be nearly related to quinia, for its oxalate only differs by containing three more molecules of water. Chlorine and ammonia also produce the green colour and precipitate of dalleiochin, which is characteristic of quinia and quinidin. It differs, however, by the solution not being fluorescent.

Chloral hydrate appears now to have become a recognised addition to our materia medica as a good hypnotic. It may, however, be well to note that a comparatively large number of deaths have occurred from its use during the past year. In every case the fatal result has arisen from one of two causes,—either from an overdose, or else by the dose having been repeated too frequently, one having been swallowed before the effect of the previous one had passed away. A very remarkable instance of the latter recently came

under my notice, and has been fully described by Dr. Norris in the *Lancet* (Feb, 28, 1871). The deceased had taken 712 grains in 9 days, 260 of which had been swallowed within 36 hours. Every part of the organs sent for analysis was preserved in the most extraordinary manner. Not until 130 hours after death did the lightest odour of decomposition become perceptible. Chloroform was obtained plentifully from the tissues by distillation, after the addition of an alkali.

Professor Wurtz has stated to the French Academy of Sciences, that the nitrate of strychnia, used hypodermically, is an antidote to the poisonous effects of chloral. I have not, however, seen a confirmation of this strange announcement.

In the *Ann. der Chem. und Pharm.*, 1870, Mr. Lieber describes a very convenient method of detecting the presence of alcohol in chloroform or chloral hydrate. He effects this by warming the suspected sample in a test-tube with a little iodized potassium iodide, and afterwards potassium hydrate. If alcohol be present, crystals of iodoform will be deposited.

Anæsthetic agents are still the subjects of much discussion. Bichloride of methylene and nitrous oxide have been tried over and over again by their respective admirers, but the weight of evidence seems to be in favour of the latter. The bichloride has too frequently induced nausea, a most distressing accompaniment to its administration, while the nitrous oxide appears to give almost universal satisfaction. Not one fatal accident has happened, though, within the last twelve months, it has been in daily use by dentists.

At a late meeting of the Medical Society in London, Dr. Richardson introduced metachloral, a singular isomer of chloral, and decomposable also by alkalies into chloroform and formic acid, but physically differing by being completely insoluble in either water, alcohol, or ether. It is a white greasy powder, which may be converted into soluble chloral by being heated to 180° C.

One of our esteemed corresponding members, Dr. Flückiger, has noticed an interesting property of oil of peppermint. When shaken with nitric acid, the oil exhibits a magnificent greenish-blue fluorescence. This hitherto undescribed phenomenon is extremely beautiful, especially when the electric spark is passed through it by means of the ordinary vacuum tube. The doctor remarks that, unfortunately, it is not a true test for the purity of the oil of peppermint, because other oils may be present without preventing the fluorescent appearance.

In a lengthy paper read at the Chemical Society, and reprinted in our Journal, Dr. Divers has made an important addition to our hitherto imperfect knowledge of ammonium carbonate. It appears that there are four varieties of this salt, having a simple relation to each other, and capable of crystallisation from a solution, viz.:—

Normal Ammonium Carbonate			$(\text{CO}_2)_2 (\text{H}_2\text{O})_4 (\text{NH}_3)_4$
Half-acid	„	„	$(\text{CO}_2) (\text{H}_2\text{O})_4 (\text{NH}_3)_4$
Acid	„	„	$(\text{CO}_2)_2 (\text{H}_2\text{O})_4 (\text{NH}_3)_4$
Hyper-acid	„	„	$(\text{CO}_2)_3 (\text{H}_2\text{O})_4 (\text{NH}_3)_4$

Dr. Divers finds that by digesting these carbonates at a gentle heat with liq. ammon. fort., they become converted into ammonium carbamate ($\text{NH}_4\text{NH}_2\text{CO}_2$), thus furnishing a curious example of the dehydration of a salt in the presence of water. He agrees with Dr. Attfield, that the commercial ammonium carbonate is a compound salt of carbonic and carbamic acids, and is remarkably constant in its composition. Dr. Divers also states that, when ammonium chloride and calcium carbonate are heated together, as directed in the British Pharmacopœia, the product is not commercial ammonium carbonate. This is an after-product during the refining.

New localities have been successfully tested for the cultivation of the poppy and cinchona plants. At the January meeting of the Pharmaceutical Society, a paper by Mr. Ward was read on a sample of Australian opium, collected in Gipps' Land, and sent to Mr. Hills for examination. It contained no less than 9 per cent. of morphia, so that the Australian climate may eventually prove favourable to the growth of the poppy plant.

In America, also the production of opium has been tried as a profitable speculation. Mr. Wilson, of Vermont, has sown $6\frac{1}{2}$ acres of land with opium poppy-seed. From the resulting crop were gathered 640 pounds of opium, averaging 6.25 per cent. of morphia, and realizing 10 dollars per pound.

In Ceylon, the cultivation of the cinchona has attracted considerable attention. The analysis of a sample sent to England showed that each pound of the bark yielded 289 grains of sulphate of quinia, 47 grains of quinidine, and 14 grains of cinchonine.

Last year, at the Liverpool meeting, Dr. C. Calvert called attention to some experiments he had been making on the composition of iron rust. In our text-books, the rust of iron is described as the hydrated peroxide of iron, with a trace of ammonia. The results of his analyses show, however, that rusted iron is a compli-

ted compound of 93 per cent. of peroxide, 6 of protoxide, $\frac{1}{10}$ per cent. of carbonate of iron, $1\frac{1}{2}$ per cent. of silica, with a trace only ammonia. Dr. Calvert finds that the idea of iron rusting from the presence of moist oxygen is entirely wrong. A long series of experiments proved that neither moist oxygen, nor moist or dry carbonic acid, *separately*, had any action on iron, but that a *mixture both* acted very energetically. Carbonic acid is the agent that determines and promotes the oxidation of iron, and not oxygen or aqueous vapour. This explains the curious fact that the presence of alkalis or their carbonates will prevent the oxidation of iron.

Our excellent secretary, Dr. Attfield, with his usual aptitude for the practical application of his favourite science, has given an exhaustive paper on a proposed new nomenclature for universal adoption in future editions of all Pharmacopœias. The continual changes that have hitherto taken place, and the consequent increase of synonyms, are often a cause of much perplexity to the dispenser. We hope that the doctor's suggestions may be fully considered by future compilers of the next editions of our own, as well as those of other countries. We should then be unanimous, and travellers would have less difficulty in getting their prescriptions prepared.

In the provinces, pharmaceutical education is gaining ground more and more. Papers read at meetings of the several associations throughout the country, show that private study and the number of students are rapidly increasing.

In America, pharmacy seems to be prosecuted with more than usual vigour. They seem determined, in that part of the world, to fulfil the words of one of their poets, when he told them that,—

“Though before you mountains rise,
Go ahead!

Scale them certainly you can.
Let them proudly dare the skies;
What are mountains to a man?”

At the December meeting of the Philadelphia College of Pharmacy, Dr. Maisch made an important communication respecting the solution of acetate of morphia and other alkaloids,—a subject, however, that had previously been alluded to by one of our members, Mr. Martindale, of University College Hospital. When the ordinary solution has been kept for some time, it becomes greatly altered in appearance; a myceloid growth rapidly forms, and a brown matter is deposited, mixed with crystals. Analysis showed these latter to be the pure alkaloid without a trace of any

acid. It is singular, also, that the solution of ammonium acetate decomposes, and has eventually an alkaline reaction.

Those of us who have been accustomed to peruse the foreign publications must have painfully missed those from Paris. The horrid transactions and frightful display of human depravity, must have rendered scientific research impossible. We heartily sympathise with our Gallic brethren, and reiterate the advice given by Horace to his friend Tibullus :—

“ Inter spem curamque, timores inter et iras,
Omne crede diem tibi diluxisse supremum.
Grata superveniet, quæ non sperabitur, hora.”

I must not, however, trespass longer upon your patience, although many things that have transpired during the past year might be profitably recalled to our memories. In the present day we, as Britons, must put forth our best energies, lest we fall into the rear of intelligent nations. Our young men are justly, though tacitly, making an urgent appeal for our help. We do not, of course, press them to join our ranks; but when they ask to be admitted, and we do receive them, we are not doing the thing that is honest, if we fail to show the greatest solicitude for their welfare. The act of taking a pupil or apprentice is now one of very grave responsibility. When we sign an indenture, we there and then become answerable for the proper education of that pupil, either by personal supervision, or by securing the services of some substitute. Nay, I go further; my own impression is, that no one ought to take a pupil unless fully competent to answer most of the many questions that crop up in the mind of an earnest student, or else to show him how to get the desired information.

On the other hand, I think that a lad who has not received a good solid education, is not the one to be a pharmaceutical pupil. His time then becomes too valuably occupied to be wasted in procuring the exceedingly little knowledge requisite for passing the preliminary examination. We often hear it said that a youth has a good education, because he is tolerably conversant with Colenso and Morell. This is a very common mistake. It is not education. Professor Huxley has justly reminded such an one, that reading, writing, and arithmetic, are only the means whereby we are enabled to open the educational casket.

I am fully conscious that I am addressing many to whom these remarks are superfluous; but the letters that appear from time to time in our Journal, too plainly evince the deficiency to which

allude. We ought not to rest satisfied with the sandy foundation of semi-ignorance, but steadily persevere in building our intellectual structure on the rocky basis of observation and experience.

Appropriate food is as necessary for the mind as it is for the body. If we choose to feed our mental powers on the trashy material that is often mis-called literature, we cannot expect to have healthy appetite for that which is good and worth remembering. That is it that prevents so many of us feeling a delight in the searches of others, or searching for ourselves? It is nothing less than a mental dyspepsia and intellectual debility. Example is far better than precept, and we cannot expect our pupils to acquire a keen relish for mental cultivation, or believe it to be necessary, if they see that we ourselves care so little, and become so apathetic.

It is no drudgery or hard work that I recommend, but a pleasant relief from the monotonous routine of a chemist's life. The test-tube or the microscope, the herbarium or the pencil, will soon amply reward the trial with the substitution of products of pleasurable surprise and wonder; for—

“Labour with what zeal we will,
Something still remains undone;
Something uncompleted still
Waits the rising of the sun.”

I cannot conclude without allusion to the indefatigable exertions of our secretary, Dr. Atfield. Few of you know what a debt is owing to him for the completion of our first Year-Book. Unforeseen and unavoidable difficulties arose, that postponed its issue till late in the season; and it is to his indomitable *esprit de corps*, and the editorial ability of Mr. J. Ince, that we are mainly indebted for this volume. I am sure, therefore, that you will allow me, in your names, to thank them heartily and sincerely.

It only remains for me now, gentlemen, to thank you for having a second time placed me in the honourable position of your President. May success crown your endeavours, and may the advancement of true pharmacy be the guiding star of the British Pharmaceutical Conference.

Mr. KEMP (Portobello): When I say that I have listened to the address with very great pleasure, I am sure I am only expressing the feeling entertained by every one present. I think we are under a very great obligation to the President for the very able, clear, and concise manner in which he has noticed the many new and important advances in pharmacy, and sketched out for us important

and interesting studies on these subjects. He has noticed in the course of his address the importance of scientific pharmacy. The time was when pharmacists were content with mere practice, with mere routine. I think that has greatly given way, and that it is now admitted that if practical pharmacy is to arrive at anything like perfection it must have a scientific basis. The very fact of the existence of the Pharmaceutical Conference is an evidence that scientific pharmacy is now carefully studied; and I have only to allude to the very large meeting now assembled as a further proof. To the success of this year's Conference, the President has largely contributed by his most excellent address, and I propose that we give him our hearty thanks.

Mr. YOUNG: I beg to second the motion which has been proposed by my friend Mr. Kemp. Mr. Stoddart has given us an admirable view of what has been done during the past year; and I am sure we are all very grateful to him for the excellent reflections contained in the concluding portion of his address. There is very much in what he said that in addition to the masters being fit to instruct their pupils, the pupils should be in a condition to be instructed. I venture to express my great satisfaction at listening to the able address which has just been delivered.

Mr. DEANE, Vice-President: It has been moved that a cordial vote of thanks should be given to our President for his very admirable address. I very cordially concur in the motion. I put it to you, as a matter of form, to say if the motion is carried.

The motion was carried amid loud applause.

The PRESIDENT: I thank you all for the cordial expression of your approval. I can only say it is a real pleasure to do anything for this Conference, a real work of love.

The following papers were then read:—

THE OXIDATION PRODUCTS OF ESSENTIAL OIL OF
ORANGE-PEEL (KNOWN AS "PORTUGAL").

By C. R. A. WRIGHT, D.Sc.,

Lecturer on Chemistry in St. Mary's Hospital Medical School.

AND CHARLES H. PIESSE,

Assistant Analyst in St. Thomas's Hospital.

PRELIMINARY NOTICE.

Through the kindness of Messrs. Piesse & Lubin, we have been enabled to examine a specimen of pure oil of orange-peel. As

ted by Soubeiran and Capitaine, and by Dr. Gladstone, this oil consists principally of a hydrocarbon, hesperidine, boiling at 174° , of formula $C_{10}H_{16}$. We found that the crude oil commenced to boil at 175° , and that 97.2 per cent. by weight came over below 180° ; the remaining 2.8 per cent. was a yellow, resinous substance, volatile without decomposition, sparingly soluble in alcohol when boiling, but very soluble in ether. In water it was almost insoluble, but it communicated to it the bitter taste of fresh orange-peel. At 100° it was perfectly fluid, but did not entirely solidify even after standing some days at the ordinary temperature. After complete expulsion of hesperidine by long-continued heating to 100° , it was perfectly inodorous; it contained no nitrogen, and on combustion yielded numbers agreeing with the formula $C_{10}H_{16}$.

Hesperidine is readily acted on by nitric acid. If undiluted a violent action ensues, a viscid, yellow, tarry substance being formed; but if diluted with its own bulk of water, nitric acid acts more slowly. By long-continued boiling, an inverted condenser being attached, the evolution of red fumes and carbonic acid is noticed for some hours, and then almost ceases; the hydrocarbon is then found to be converted into a brown resin, becoming very soft at 100° , but hard and brittle after cooling. The resin contains a large quantity of nitrogen, and is apparently formed from the original hydrocarbon by addition of oxygen and replacement of hydrogen by NO_2 . The examination is not yet completed.

By the action of stronger nitric acid on this brown resin, a yellow solid is not softening at 100° , and containing less carbon and hydrogen, is produced. The formation of this body is accompanied by the production of much oxalic acid, and possibly of a nitrogenized acid, the snow-white oxalic acid obtained after precipitation, as lead salt, decomposition by hydric sulphide, and several recrystallisations retained nitrogen, and gave numbers on analysis (as well as its barium salt) approximating to, but not agreeing very well with, those required by theory.

On heating 1 part of hesperidine with 30 parts of water, 1 of sulphuric acid, and 3 of potassium dichromate, a slow evolution of CO_2 is noticed. After some hours boiling with an inverted condenser attached, the majority of the hydrocarbon is apparently unattacked, and on distilling an acid distillate is obtained. This acid, converted to barium salt and silver salt, gave numbers indicating that the acid was essentially acetic. The barium salt also gave all the characteristic reactions of an acetate.

Sulphuric acid and potassium chlorate have a violent action on hesperidine, and produce a viscid tar not yet fully examined.

The PRESIDENT said that this paper accounted for the difficulty they had of preserving the essential oil of orange-peel. No doubt the oxidation referred to would help to explain the change essential oil of orange-peel undergoes.

Mr. HANBURY said he supposed the gentleman who read the paper had not found the source of this essential oil; whether it was got from home or abroad—from the bitter or sweet orange. He thought it would be interesting to know about that.

Professor WRIGHT said all he knew was that it was received from Piesse & Lubin, from abroad, and that it was as pure a material as could be made. He obtained the article from the firm referred to; but as to the nature of the orange from which it was derived, he was not acquainted with it.

Dr. ATTFIELD said that there were many gentlemen present who would feel as he did, that they should recognise the labours of Professor Wright, by thanking him for his paper. But, perhaps, it would be advisable to do as they had done at previous meetings, namely, wait till the end of the meeting, and then thank the authors all at once. Writers of papers themselves generally said that they were so abundantly gratified in making the researches, that they did not care much for these formal acknowledgments, and were willing to put off to the end of the meeting any recognition of their services in this respect.

It was agreed to postpone giving thanks to the respective authors till the close of the meetings.

NEW DERIVATIVES FROM CODEIA.

BY CHARLES R. A. WRIGHT, D.Sc.,

Lecturer on Chemistry in St. Mary's Hospital Medical School.

By the action of hydrobromic acid (48 per cent. H Br) on codeia at 100° F., there is produced firstly a base containing the elements of codeia, where OH is replaced by Br; and by a further action two other bases, one containing one atom of oxygen less than codeia, the other having the composition of four molecules of codeia coalesced together, one of the 84 hydrogen atoms in the product being replaced by Br.

Codeia	$C_{18}H_{21}NO_3$.
Bromocodeia	$C_{18}H_{19}BrNO_2$.
Deoxycodeia	$C_{18}H_{21}NO_2$.
Bromotetracodeia	$C_{72}H_{83}BrN_4O_{12}$.

The last base is almost insoluble in ether, whereby it can be separated from the other two, which are readily soluble in that menstruum.

The further action of hydrobromic acid on the above bodies gives rise to the substitution of H for CH_3 in them, the following substances being obtainable by this means :—

Deoxymorphia	$C_{17}H_{19}NO_2$.
Bromo-dicodeia-dimorphia	$C_{70}H_{79}BrN_4O_{12}$.
Bromotetramorphia	$C_{68}H_{75}BrN_4O_{12}$.

When treated with strong hydrochloric acid at the ordinary temperature, the bromine in the tetra-bases described above is replaced by chlorine. Thus, the following bodies have been analysed (*i.e.* their salts) :—

Chlorotetracodeia	$C_{72}H_{83}ClN_4O_{12}$.
Chloro-dicodeia-dimorphia	$C_{70}H_{79}ClN_4O_{12}$.
Chlorotetramorphia	$C_{68}H_{75}ClN_4O_{12}$.

The physiological action of the above bodies does not appear to be very marked. Dr. Michael Foster finds that the above bodies produce in cats a peculiar excitement of the nervous system and paralysis of inhibitory fibres of the pneumogastric. Deoxycodeia and deoxymorphia salts produce also convulsions of an epileptic character. In case these properties should ever cause the substances to be used in medicine, probably a pill would be the most convenient form of exhibition, as the sparing solubility of their salts in water, and the comparatively large dose requisite, would preclude the use of hypodermic injections.

On treating codeia with hydriodic acid (55 per cent. H I) and a sufficiency of phosphorus, methyl iodide is evolved, and a series of products obtained which much resemble one another in physical characters, being amorphous, brittle, or tarry bodies. If the action takes place at 100° , 110° – 115° , or at higher temperatures up to 130° , the following three substances appear to be produced :—

- I. $C_{68}H_{86}I_2N_4O_{12}, 4HI$. . at 100°
- II. $C_{68}H_{82}I_2N_4O_{10}, 4HI$. . at 110° – 115°
- III. $C_{68}H_{82}I_2N_4O_6, 4HI$. . up to 130° .

On boiling up with water, these bodies part with the elements of hydriodic acid, and either lose or take up those of water. Thus the following substances have been procured:—

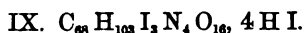
- IV. $C_{88}H_{81}IN_4O_{10}, 4HI$. . from II.
 V. $C_{88}H_{80}N_4O_{10}, 4HI$. . from both I. and II.
 VI. $C_{88}H_{88}N_4O_{10}, 4HI$. . from III.

A similar reaction also appears to take place by precipitating the solutions of I., II., III. with sodium carbonate; in this way the free bases of the compounds IV. and V. have been obtained from I.

Lastly, on treating with hydriodic acid, the compounds IV., V., VI., the elements of hydriodic acid and water are taken up, forming compounds, not losing the added water, even by long-continued exposure to a temperature of 100° . Thus,—

- VII. $C_6H_{107}I_3N_4O_{22}, 4HI$. . from both IV. and V.
 VIII. $C_8H_{88}IN_4O_{10}, 4HI$. . from VI.

While, on treating I. with hydriodic and phosphorus, the following compound (containing the elements of hydriodic acid and water more than III.) was produced:—



The physiological action of the foregoing compounds has not yet been examined particularly, but it does not appear to be marked, no ill-effects having been observed while working with the bodies. Names have not yet been given to these substances, owing to their complexity.

The codeia used in the experiments, briefly described above, formed part of a large supply, exceeding twenty ounces, most liberally presented for the purpose by the eminent manufacturing chemists, Messrs. Macfarlane, of Edinburgh.

MR. BRADY.—I do not rise, sir, to offer any criticism upon the elaborate paper which has just been read, but merely to express the gratification which I am persuaded we all feel in receiving this first contribution of Dr. Wright's to our proceedings. Its presentation at this meeting comes with particular appropriateness, inasmuch as Edinburgh seems to have become the centre of the manufacture of the opium alkaloids in Great Britain. Nor is this all, the open-handed liberality of the manufacturing firms of this city—Messrs. Macfarlane and Messrs. T. & H. Smith—towards those engaged in researches on this class of substances, has placed scientific men under great obligation. I am bound to make this statement, for I

have profited by their kindness. Some years ago, when Mr. Dean and myself were working a little upon opium products, we were kept supplied with material we could hardly have obtained otherwise without great labour and cost, by the thoughtful kindness of the two firms I have just named.

Professor WRIGHT said that Mr. Brady had called to his mind what he ought to have mentioned before, though it would be seen that it had not been overlooked in his paper. He most sincerely returned thanks to the Messrs. Macfarlane, not only for a supply of codeia, but many other alkaloids. The codeia given by Messrs Macfarlane weighed upwards of twenty ounces.

REPORT UPON THE CHLORAL OF TRADE.

By ALFRED H. MASON, F.C.S.

The unsatisfactory reports which we gather from investigations published in papers from foreign sources,* of the quality of hydrate of chloral sold in those countries, behoves the pharmacist to exercise discretion in the purchase of this most important therapeutical agent now so frequently required by him, and the committee of this Conference wisely suggests inquiry and reports upon the quality of "the chloral of trade."

To arrive at the conclusions given in this report, I have adopted the sulphuric acid test, the ammonia test, and a chromium test.

The *Sulphuric Acid Test* must give an accurate estimation of the quantity of chloral present in the chloral salt. I have applied this test in the manner suggested by Dr. Versmann,† excepting that I prefer to increase the temperature of the bath to facilitate the separation, reading the result at 60° Fahr.: thus, if 10 grammes of hydrate of chloral yield 5·8 of chloral,—the specific gravity of which is 1·502 (Miller), the per centage will be 87·1, which divided by the theoretical proportion (89·123) shows 97·74 per cent. of hydrate of chloral in the given sample.

The *Ammonia Test* does not give such high results, owing to some secondary decomposition, of the nature of which I have not as yet been able to satisfy myself. Sometimes, also, there is a flocculent deposit (occasionally dirty) which separates the chloroform layer from the supernatant liquor, and renders accurate reading difficult:

* Dr. Squibb,—Proceedings American Pharmaceutical Conference, 1870. Dr. Jacobson, "Chemisch Technisch Repertor," and others.

† *Pharmaceutical Journal*, p. 701, vol. i., 3rd series.

on the other hand, the ammonia process will detect impurities which the sulphuric acid test does not show; several samples which I have analysed during the last few months, yielding chloroform of a brown colour,—and the purity of the chloroform produced, is all-important, from the theory of the therapeutical action of hydrate of chloral.

To arrive, therefore, at *results proportionate* with the sulphuric acid test, it is necessary to add about four per cent. to the observed yield, why I am not prepared to say, but my experiments do not testify that the *chloroform produced from the volumetric analysis* is soluble in water, or in the ammonia liquid, except in very minute quantities. If ten grammes of hydrate of chloral yield 4·5 of chloroform, sp. gr. 1·497, it is necessary to say 4·7, which equals 70·3%, and this divided by the theoretical per centage (72·2) equals 97·45% of hydrate of chloral in the given sample.

Chromium Test.—Mr. Miles Smith suggests this test for the detection of alcoholate of chloral, or alcoholic impurities in a solution of hydrate of chloral, and with his permission, I have the honour to introduce it. I have not seen details of his data; but in working out the suggestion I have adopted the following method:—

Test Solution.—One gramme of bichromate of potash, dissolved in 10 c.c. of water, to which is added 5 c.c. of pure redistilled sulphuric acid.

I dissolve one gramme of hydrate of chloral in 5 c.c. of water, adding five drops of the test solution and heating the tube: if the sample is perfectly pure, no change takes place; nor with an average sample of hydrate of chloral for one hour; but a similar solution of alcoholate of chloral immediately becomes a brilliant green colour; and by adding alcoholate to a solution of hydrate of chloral, the same change takes place, the colour being more or less deep, according to the quantity of alcoholate present; if allowed to stand for twenty-four hours, the reduction will take place with many samples; and I should judge the proportion of alcoholic impurity present by the time taken to cause the reaction, and the intensity of the colour produced.

To detect alcohol in the *chloroform* produced in the analysis, I added a minute portion of binitrosulphide of iron, which produced in each instance a brown tint more or less deep according to the amount of alcohol present.*

All the samples of *cake* chloral hydrate reported upon were affected more or less by the chromium test; but the test is delicate,

* Roussin's test, *Chemica News*, Sept. 1, 1860. "Miller's Chemistry," p. 782.

and an accidental alcoholic impurity for which the manufacturer might not be to blame would be traced.

It is my opinion from these investigations that the quality of the chloral of trade is satisfactory, considering the enormous difficulties which the manufacturers have to contend with in producing this remarkable body; there are variations in the production of different manufacturers, and even different batches from the same manufacturers differ. The crystalline variety is far more pure, and preferable to the cake, being much more convenient for dispensing, and more easily preserved, the cake being very hygroscopic, attracting moisture, which soon deteriorates its value. The quality is much better than it was some twelve months ago; and I think the paucity of reports in the medical journals of unsatisfactory results in administration, tend to show that the want of confidence which was then being evidenced by medical men was due to its impurities, rather than its imperfections.

TABLE NO. I.

These samples represent the manufactures of Messrs. Foot, Barrett & Temple, London; Messrs. Martius & Bartholdy, Berlin (known as Liebreich's); Mr. Saame, Gottingen; Messrs. E. de Haen & Co., Hanover; Dr. Marquart, Bonn (who has now discontinued his manufacture); samples marked S, and M and K, and a sample from Messrs. E. W. Howe & Co., London.

PERCENTAGE OF HYDRATE OF CHLORAL.				APPEARANCE OF THE SAMPLE.
Sample	By Sulphuric Acid Test.	Actual Chloroform yield.	By corrected Ammonia Test.	
A	97.74	67.3%	97.45	Small transparent dry <i>crystals</i> . of small white crystalline appearance, almost powder, with fresh fruity smell.
B	97.74	67.3%	97.45	
C	97.74	67.3%	97.45	Hard, transparent, dry <i>crystals</i> , in appearance somewhat resembling nitrate of silver.
D	96.06	65.8%	95.37	White thin cakes, easily broken.
E	96.06	65.8%	95.37	Very hard, white cake.
F	96.06	65.8%	95.37	As B, but rather damp.
G	96.06	65.8%	95.37	Small, hard, dry, dull <i>crystals</i> .
H	96.06	63.4%	query	Thick cake, rather damp.
I	94.37	63.4%	query	Very damp cake, of dull crystalline appearance.
J	94.37	64.3%	93.30	Thin, white, dry, solid cakes, breaking with short fracture.

TABLE NO. II.

Samples of some of the same manufactures, sold by them in commerce.

PERCENTAGE OF HYDRATE OF CHLORAL.				APPEARANCE OF THE SAMPLE.
Sample.	By Sulphuric Acid Test.	Actual Chloroform Yield.	By corrected Ammonia Test.	
A	97.74	67.3%	97.45	Small hard transparent crystals.
E	97.74	65.8%	95.37	Very white, solid cake.
E	94.37	63.4%	92.05	Same appearance, but not so hard.
H	92.69	62.8%	91.50	Deliquescent thick bright cake.
J	96.06	65.8%	95.37	Fine white cake, easily breaking.
K	92.69	64.3%	93.30	Thin white cake, friable between the fingers, rather damp.

The PRESIDENT said that, before asking for any discussion on this paper—and he knew there were many who would take part in it—there was another by Mr. M. M. Pattison Muir, F.C.S., which he thought might be taken.

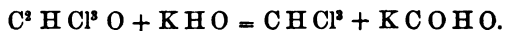
Dr. ATTFIELD then read as follows:—

EXAMINATION OF SAMPLES OF COMMERCIAL CHLORAL HYDRATE.

By M. M. PATTISON MUIR, F.C.S.

As chloral hydrate has of late become a somewhat extensively-used medicine, and as the purity of compounds employed in Pharmacy is a matter affecting the interests of many, there was most properly noted in the circular of this Society, among the subjects for investigation, "The Purity of the Chloral Hydrate of Trade." The experiments which I now have the honour to lay before this Conference have been undertaken, not with any intention of adding new facts or new reasonings to the Science of Pharmaceutical Chemistry, but rather with the view of showing whether or not the chloral hydrate in common use among druggists and pharmacutists is of fair average purity.

Chloral hydrate, by the action of a caustic alkali, is broken up into chloroform and a formiate of the metal of the alkali employed. Thus, with caustic potash:



I have endeavoured in these experiments to answer, for each sample examined, the following questions:—

(1) Does the sample yield, on treatment with a caustic alkali, such a percentage of chloroform as might reasonably be expected?

(2) Does the sample contain any, or any appreciable amount of, chloral alcoholate?

And further, with regard to commercial chloral hydrate generally, have endeavoured to show which samples, judging from their appearance and physical character, are to be regarded as most pure. And lastly, the general question has been answered,—

Is the chloral hydrate now generally sold by druggists, of fair average quality and purity?

Pure chloral hydrate is easily soluble in water: upon heating, it dissolves; leaving, on cooling, a perfectly clear liquid. Chloral alcoholate, on the other hand, heated with water, melts, but does not dissolve in the water; and, on cooling, solidifies again beneath the water.

With strong sulphuric acid, again, pure chloral hydrate floats on the surface, and; on heating, slowly melts, forming a layer of anhydrous chloral, without browning or otherwise discolouring the acid. Chloral alcoholate colours the acid brown, on being heated in a similar manner.

With nitric acid—25% strength—pure chloral hydrate gives, on application of heat, little or no reaction; alcoholate gives violent action, red fumes being given off.*

The boiling point of chloral hydrate is 96° to 98° C.; of chloral alcoholate, 114° to 115° C.

The process adopted for estimating the amount of chloroform yielded by the samples, was that described by K. O. Müller (*Chem. News*, vol. xxiii., p. 113), viz.:—Into a glass tube, graduated from the bottom into cub. centims., was introduced a certain known quantity of the sample; pure caustic potash solution was then added; and after standing from ten to fifteen minutes, the tube and its contents were thoroughly shaken, until all the chloral hydrate was completely dissolved. The tube, being securely corked, was set aside; and after three or four hours the number of cub. centims. of chloroform was read off. This was multiplied by the sp. gr. of chloroform; the figure taken being 1.5, and so was obtained the percentage of chloroform yielded by the sample under examination.

The results are embodied in the following table, from which I would conclude—

(1) Generally, the samples were of a fair average quality.

(2) None of them, so far as I may infer from my experiments, contained chloral alcoholate.

* "Year-Book of Pharmacy," 1870, pp. 112, 113.

(3) The purest was that sold in small transparent pieces, nearly dry to the touch, and not having a very strong pungent odour.

(4) The various samples varied in the amount of chloroform yielded, chiefly, it seems to me, on account of the time each had stood in the shop. Chloral hydrate easily absorbing moisture, and the stopper of the bottle in which it was kept being frequently removed, that sample which had been longest in the shop, and from which most prescriptions had been made up, must of necessity be more moist, and hence yield less percentage of chloroform, than that newly or but recently received from the maker.

This view is confirmed by the amount of chloroform yielded by samples Nos. 5 and 6, which were obtained from wholesale dealers, and which, therefore, had not been exposed to the varying fortune likely to meet them while standing on the shelves of a druggist's shop.

I. Physical appearance of sample.	II. Behaviour on heating with water.	III. Behaviour on heating with strong sul- phuric acid.	IV. Behaviour on heating with dilute nitric acid.	V. Boiling Point.	VI. Percentage of chloroform yielded on treatment with caustic alkali.
I. White, solid, in large pieces, showing definite crystalline structure; non-transparent. Slightly moist to the touch. Strong pungent odour.	Easily soluble; on cooling, perfectly clear liquid.	Melted; forming layer on the surface; no browning of the acid.	Dissolved easily; no fumes given off.	97° C.	67.70
II. Same as above, but in smaller pieces; semi-transparent	do. do.	do. do.	do. do.	96.5°-97°.	65.90.
III. White cakes, not showing any definite crystalline structure; falling easily to powder. Moist to the touch	do. do.	do. do.	do. do.	96.5°.	68.07.
IV. Very pure white; hard pieces, non-transparent, showing very small crystals when broken. Moist to the touch	do. do.	do. do.	do. do.	97°	66.15.
V. Hard white cakes; non-transparent. Drier than any of above	do. do.	do. do.	do. do.	97.5°.	70.83.
VI. Small round pieces; transparent, not showing any needle-shaped crystals, as that of the others did. Very slightly moist. Not so strong an odour as the others	do. do.	do. do.	do. do.	96.5°-97°.	71.02.
VII. Small opaque pieces, showing very little crystalline structure	do. do.	do. do.	do. do.	97°-98°.	67.71.
VIII. Large pieces, semi-transparent; distinctly crystalline throughout. Much more moist than any of the previous samples	do. do.	do. do.	do. do.	96°-96.5°.	60.93.

Generally, then, these experiments show that the chloral hydrate present sold by pharmaceutical chemists is of a fair degree of purity.

The PRESIDENT said he would be glad to hear any one who would give information on this subject. He saw Dr. Paul, Mr. Wood, Mr. Williams, and others present who, he had no doubt, would take part in the discussion.

Dr. PAUL said he had nothing further to say than that both the experiments seemed to confirm the general result arrived at by several experimenters some time ago, viz., that the hydrate of chloral of commerce was so far a pure article that the amount of impurity varied within the narrow limits of about 5 per cent.; and it was only in a few cases that it came up to as much as 5 per cent. In those cases where the amount of hydrate of chloral in the commercial article was 1, or 2, or 3, or 5 per cent. less than if the article were absolutely pure hydrate of chloral, the impurity was in most cases water, due to the hygroscopic nature of the substance. In the specimens he himself examined there was only one case of alcoholate met with, and that was not a bought sample, but one obtained as a specimen from a house in the city reported to have been selling it. Another impurity that was observed in one or two cases was a flocculent deposit that was formed when the ammonia test was applied. The deposit obscured the test, and one was not able to tell how much chloroform was produced, because the deposit collected between the chloroform and the watery liquid, rendering indistinct the line of separation between the two substances.

Mr. WOOD said that in the remarks he was about to make he would probably run somewhat counter to the general current of opinion, but he must protest against attaching too much importance to the chloroform-test. It occurred to him that it was leading them rather astray, and likely to do more harm than good. No doubt it was very valuable, and served a useful purpose when it was suggested by Mr. Williams; but what they required at the present time, he believed, was a means of recognising that they had chloral hydrate, and no other chlorine substance or impurity which might be formed during the process of manufacture. The chloroform-test was not required, as it appeared to him, because it was not a sufficient means of ascertaining the purity in these respects, and because the presence or absence of a little more or less water in a chloral hydrate was a matter of slight importance to them, provided that they had pure chloral and no other substance. It could merely affect the commercial and not the medicinal value. He believed it

was the general experience, as stated by Dr. Paul and others, that what caused the principal variations in the chloroform results was the presence of rather more or less water in the sample they were examining. But in the manufacture of chloral it did appear probable that there were produced certain other chlorinated substances, and that these might remain associated with the chloral in greater or less proportion; and those substances were likely to have considerable influence on the medicinal properties of the article. There was a very great temptation to every manufacturer to stop the action of the chlorine upon the alcohol as soon as it would yield a crystallisable article that was saleable; but still at that time it might retain more or less, and sometimes a considerable portion, of those other products that had been first formed, and from which the chloral had been derived. An ethereal oily liquid, of high boiling point, described by Liebig, Dumas, and others, as the original chloric ether, was the body first formed by the action of chlorine on alcohol. It was that body which ultimately yielded chloral by the further action of chlorine, and its presence would be likely to influence the medicinal efficacy of the chloral. Moreover, alcohol of commerce was by no means pure, it contained considerable quantities of fusel oil and other products; and if in the manufacture of chloral such spirit had been used, they would have the products of the action of chlorine on those other substances which were impurities in the alcohol. German spirit was known to contain appreciable quantities of aldehyd; and Dr. Hofmann had recently shown that aldehyd yielded by the action of chlorine a crystalline body resembling chloral, but having an entirely different composition. As far as his experience went, the chloroform-test failed to be of much use in indicating the presence or absence of such substitution products. Many of these substances gave an oily liquid on treatment with an alkali, so that by this method a liquid obtained from chloral might or might not be chloroform. It might consist of that alone, or it might contain other liquids. They never applied any further means of recognising the purity of the chloroform layer. They had no means of examining it. It appeared to him, therefore, that the test was apt to mislead them; for if they got a good result in point of quantity they thought the sample good. By what they really required was the means of testing chloral, so as to recognise the presence of other chlorine products. He was inclined to regard the boiling point as a more valuable test to apply. Unfortunately it seemed impossible to distil hydrate of chloral to absolute dryness without increasing the boiling point. He thought

they required some test which would show the presence of other substances than chloral, rather than being particular as to whether they got 1 to 2 per cent. of water in excess.

Dr. PAUL said he wished to express the satisfaction with which he had heard Mr. Wood's remarks. He thought he had taken the true chemist's point of view, and had raised a question as to the purity of hydrate of chloral in a far more important manner than had yet been done. Looking to the materials used for the manufacture of hydrate of chloral, there was, he thought, no doubt that there might be other chlorine compounds in the chloral hydrate of commerce. He was sure that everybody would agree with him in hoping that before the Conference met next year Mr. Wood would exercise the ability and opportunities he possessed of carrying out an inquiry in such a way that he could place before them some positive evidence on the matter.

Mr. WILLIAMS said he agreed with Mr. Wood as to the importance of discovering other chlorine compounds in chloral. He explained some experiments he had made in distillation, and said he thought he redistilled chloral much sweeter and nicer in flavour than the chloral from which it was prepared. It was all the purer, and warranted the expense of distillation.

Mr. HANBURY said he did not understand the author of the first paper to say, whether the samples he examined had been obtained from manufacturers who were previously informed that they were for analysis, or in the ordinary way of trade. That was one point he thought they should know.

Mr. UMNEY said the author had stated that chloral hydrate had been manufactured in large quantities in this country. He thought they were entitled to know where it was manufactured, as they were told that there was only one place where it was produced. Perhaps Mr. Mason could enlighten them on the subject.

Mr. MASON said he applied to manufacturers for chloral hydrate and they sent it to him. One firm refused to entrust him with a sample of their manufacture.

Mr. UMNEY said he knew one house that had tried to manufacture it, but the product was mixed with alcoholate. Perhaps Mr. Wood could give some information on the subject.

Mr. WOOD said he thought it was a misfortune to introduce manufacturers' names into such matters; but as the question had been asked, he might state that he knew of a firm in London, the one named by Mr. Mason as sending him samples, that made large quantities of hydrate of chloral, and he believed in a considerable state of purity.

Mr. KERR (Dundee) asked if he could be informed whether there was any general test of smell by which a good sample of hydrate of chloral could be distinguished from a bad one. On one occasion he received a sample which had not the sweet smell of chloral, but an acrid smell. He asked the opinion of a firm on the subject, and they told him that it was good, and that the smell varied. When the stopper of a bottle was taken out, it left the chloral different from what it was when quite close. It would be useful to dispensing chemists to know whether there was any test such as he had indicated.

Mr. ATKINS said he also wished to put a question. He had not yet quite learned from the debate whether the cake or the crystalline form was to be considered the best and purest specimen for dispensing.

Mr. MASON said he had already answered both questions.

Dr. ATTFIELD said that Mr. Muir also seemed to have come to the conclusion that the crystalline was the best.

Mr. ROBBINS (London) said that a gentleman of his acquaintance had got some pounds of the crystalline substance, but after trying it he gave it up, and returned to the use of the cake. He said that in many cases he did not find the action so good. He (Mr. Robbins) thought it would be well to know if similar results were found in other cases.

The PRESIDENT, in regard to Mr. Kerr's question, said that probably the sense of smell could not be a substitute for a chemical test. In the case of pure chloral, the pungent smell disappeared by constant opening of the bottle. The discussion seemed to be satisfactory as to the state of chloral as a manufactured product.

BRIEF REMARKS ON THE BARK OF RHAMNUS FRANGULA, OR BLACK ALDER-TREE, A SHRUB OF THE NORTH OF EUROPE (PENTANDRIA MONOGYNIA.)

By H. C. BAILDON, EDINBURGH.

Some time since a gentleman from Holland applied to me to prepare for him a decoction of the *Rhamnus Frangula* bark. The bark he brought with him, having previously found that he could not obtain it in this country. He spoke most enthusiastically of its good properties as a gentle cathartic, which had proved very beneficial to himself, and which was much used and esteemed by the medical

profession in Holland. He kindly offered to procure for me a small quantity of the bark. To my surprise, I shortly afterwards received a bale containing nearly a quarter of a cwt., accompanied by the following letter. He writes, "I hope you will find it giving as much benefit generally as I have derived from it personally. The preparation of my Dutch physician was 3 or 4 drams of bark to a pint of water boiled down to half a pint. Two or three tablespoonfuls occasionally night and morning, as an aperient. Than this nothing can be more simple or less injurious, and it does not require increase of dose, but the contrary."

I am aware that this drug is not altogether unknown in this country, though I believe rarely or never used. In the 2nd volume of the first series of the PHARMACEUTICAL JOURNAL, page 721, I find a letter signed George Mennie, Plymouth, speaking very favourably of it as a purgative and alterative, and again in the 9th volume, page 537, there is an analysis by M. Benswanger.

I have repeatedly taken the decoction myself, and find the taste not unpleasant, with a slight prussic acid flavour, of which the analysis shows traces. It operates gently as an aperient, without griping, in doses of two or three tablespoonfuls. It appears to me to possess properties which should in many cases render it a valuable substitute for senna,—which is often found drastic in its effects, and is nauseous to take,—and to be especially suitable for children.

In Holland it must be very plentiful, as it was charged me only at the rate of about 10*d.* per lb., including cost of carriage. A specimen of the bark and decoction is now upon the table.*

The Conference then adjourned from half-past twelve to two o'clock.

The Conference resumed at two o'clock.

Dr. ATTFIELD read the following paper:—

THE COMPOUND IRON MIXTURE OF THE PHARMACOPŒIA.

By C. A. STAPLES.

This has always been a favourite medicine, and, when carefully prepared, is perhaps one of the safest and most efficacious of the tonic chalybeate emmenagogues, and, consequently, it is the one most frequently prescribed; but it has always been exposed to the

* Mr. Baildon stated that he should be happy to forward to any pharmacist a sample of this black alder bark, from 73, Princes Street, Edinburgh.

great objection that its extemporaneous preparation takes considerable time, and it cannot be kept ready for use as its character soon changes,—a few hours making a perceptible difference in its appearance, even if it does not in its medicinal efficacy. To remedy this defect, I endeavoured to prepare it in a concentrated form in two bottles. After a few experiments, I adopted the following formula, which I have used for a number of years, and the result has been so satisfactory as to leave nothing to be desired:—

R	Gum. Myrrh.	℥ij.
	Potas. Carb.	℥j.
	Sp. Myrist.	℥viiij.
	Aq. Rosæ	ad ℥xx.

The myrrh should be very carefully selected,—clear pale pieces, presenting an opaque fracture, being the best. Beat it as fine as possible in a large mortar, then add the carbonate of potash with a little rose-water, and grind it to a smooth paste, gradually add about half a pint of rose-water to make a fine emulsion; add the spirit of nutmeg and as much more rose-water as will make it twenty ounces; preserve it in a stoppered bottle, labelled “Concentrated Myrrh Emulsion pro Mist. Ferri Co. ℥j to ℥j.”

For the other bottle, boil 2 fluid ounces of distilled water in a glass flask; add ℥j. of sulphate of iron, pure and free from oxide, dissolve and filter it into a 6-ounce bottle, and fill it up with simple syrup, label it “Syrup of Sulphate of Iron, gr. j. in ℥vj., or ℥xv. to each ounce, of Mist. Ferri Co.”

These preparations will be found very convenient; as for each ounce of the mixture you have merely to measure ℥j. of the emulsion and ℥xv. of the syrup, dilute each with a portion of rose-water, mix and fill the bottle with rose-water; and mist. ferri co. of excellent quality is made in a few seconds.

Both preparations keep well; the quantity of spirit in the emulsion preserves it from decomposition, and it rather improves by keeping; and the syrup will be found to keep free from oxide, which the crystals rarely are, however pure they may appear to be; it may also be used for dispensing sulphate of iron in other mixtures, where the sugar is not an objection. For this purpose I make the above solution of ℥j. of sulphate into an 8-ounce bottle of syrup, this gives one part of sulphate in eight measures of syrup, which I find more convenient for general dispensing, but it contains too much sugar for the mist. ferri co. as directed in the present edition of the “Pharmacopœia.”

Mr. HORNCASTLE said he would like to know whether the mixture formed in this way was as good as otherwise. He had not been so well satisfied with its appearance as when prepared at the time. He had found that sulphate of iron might be preserved with the greatest ease by avoiding putting it in a bottle. If it is put in a proper box, it might be kept in perfection for an unlimited period.

Mr. SCHACHT said that Mr. Horncastle had spoken of the difficulty of keeping the sulphate of iron free from change, and that it was less likely to change if kept in a box than in a bottle. This was a new idea, and he could scarcely have expected the result; but, of course, there was the well-known fact, practically more interesting, that a little piece of camphor put into the bottle prevented the change. He had himself noticed that it had that effect; and if it was the case that a little bit of camphor prevented any change, it must be some chemical influence, and he should like to know if any gentleman could give an explanation of that which was to him a great mystery.

Mr. MATTHEW said that as to keeping sulphate of iron in a box, he had not done so, but he had kept chemically pure sulphate of iron in a loosely-corked bottle, and it did not suffer any change in the course of five or six years. He had not tasted it, but the colour was as good as when he received it.

Mr. WILLIAMS said he found that the crystals would keep for a considerable period when they were solid. There were certain kinds of sulphate of iron that would keep, and it was because of the density and solidity of the crystals, and did not depend upon the impurity of the metal.

Professor ATTFIELD said that many specimens of sulphate of iron made by his students came under his notice every year; and he found that when a solution gave single crystals, those single crystals were always hard; such crystals had no interstices, and consequently no moisture between their plates, and, when dry, kept remarkably well. Sulphate of iron in masses was very liable to oxidation, but single unbroken crystals retained their colour for a much greater length of time, whether kept in bottle, box, or brown paper.

Mr. HORNCASTLE said that this subject had occupied his attention for some years, and he also believed the presence of water which was enclosed within the masses of crystals, was the source of difficulty.

Mr. ROBBINS also was of opinion that the keeping qualities of the crystals depended on their hardness and freedom from water, mechanically retained in thin interstices; and mentioned as an

example that he had a natural crystal of large size, which was kept in a glass case for some years, showing scarcely a trace of oxidation.

REPORT ON THE PERMANGANATE OF POTASSIUM OF PHARMACY.

BY ALFRED H. ALLEN, F.C.S.,

Lecturer on Chemistry at the Sheffield School of Medicine, etc.

Permanganate of potassium occurs in the form of prismatic crystals, so deep in colour as to appear black, with brilliant coloured reflections. The crystals are anhydrous, permanent in the air, and soluble in about sixteen parts of cold water. The solution is neutral to test paper and a most powerful oxidizing agent, organic matter being rapidly turned brown by the reduced salt.

The amount of real permanganate was estimated by dissolving the salt in 500 parts of distilled water, and deoxidizing it by an accurately measured quantity of oxalic acid solution of known strength, the liquid being acidified with sulphuric acid. This is the ordinary method of determining the strength of solutions of permanganate, and is rapid and accurate.

The oxalic acid in 1000 grammes of distilled water. In the latter experiments a solution of half this strength was used. Five atoms of oxalic acid are deoxidized by two atoms of permanganate, therefore 630 parts $H_2C_2O_4 + 2 aq. = 316$ parts $KMnO_4 = 80$ parts available oxygen.

No. 1 was a sample of crystallised permanganate of potassium obtained in Sheffield. It was dissolved in 500 parts of water decolorized with the standard oxalic acid, of which 10 c.c. oxidized by 163 c.c. of the permanganate. These numbers pond to a percentage of 96.93 of pure permanganate.

No. 2 sample was bought in Newcastle-upon-Tyne. The best of several specimens. The mean result of the analysis a percentage of potassium permanganate of 98.87.

No. 3 had been in the possession of the author nine and was purchased in London. It contained 93.55 per permanganate.

Following are the tabulated results of the examination of three samples:—

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	No. 1. Per cent.	No. 2. Per cent.	No. 3. Per cent.
Real K Mn O_4	96.93	98.87	93.55
Available Oxygen	24.54	25.03	23.69

All three samples contained traces of sulphate, but no chloride. On solution in water they left a small quantity of a heavy, dark-coloured residue. That from No. 3, which was largest in quantity, dissolved in oxalic acid with effervescence, and the solution, rendered alkaline with ammonia, gave a brownish precipitate with potassium ferricyanide, proving the residue to have been manganese dioxide. The residues from Nos. 1 and 2 seemed similar.

The liquor potassæ permanganatis of the British Pharmacopœia contains 80 grains of the salt to the pint of water =

$$\begin{aligned}\text{K Mn O}_4 &= 0.9143 \text{ per cent.} \\ &= 9.143 \text{ grammes per litre.} \\ = \text{Available Oxygen} &2.315 \quad \text{,,} \quad \text{,,}\end{aligned}$$

A sample of Condyl's Crimson Disinfecting Fluid had an oxidizing power equal to—

$$\begin{aligned}\text{K Mn O}_4 &1.550 \text{ per cent.} \\ &= 15.50 \text{ grammes per litre.} \\ = \text{Available Oxygen} &3.921 \quad \text{,,} \quad \text{,,}\end{aligned}$$

A specimen of Condyl's Green Fluid had almost as great an oxidizing power as the crimson. The active oxygen of an equal number of atoms of manganate and permanganate is as 4 : 5, and the atomic weight of the former salt being higher, gives the calculated amount of manganate of potassium in the green fluid as—

$$\begin{aligned}\text{K}_2 \text{ Mn O}_4 &= 24.0 \text{ grammes per litre.} \\ = \text{Available Oxygen} &3.883 \quad \text{,,} \quad \text{,,}\end{aligned}$$

The oxidizing power of the green fluid is not entirely due to manganate, as a small but variable amount of permanganate is always present. This may be detected by precipitating the manganate with barium chloride, and filtering through asbestos, when the crimson colour of the permanganate becomes apparent.

A qualitative analysis proved the crimson fluid to contain much sulphate, evidently due to the sulphuric acid employed to neutralize the excess of alkali in the crude product. The green fluid was strongly alkaline, the crimson nearly neutral. In other respects they were similar.

It was not thought requisite to examine a larger number of specimens of permanganate, as inquiry proved it to be of limited

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 application in pharmacy, and the above results showed that ~~the~~ ^{the}
 crystallised salt was practically pure.
 FIELD read a paper on—
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The paper on Chinese blistering-flies by Dr. F. Porter Smith, recently published in the *Medical Times and Gazette*, mentions the employment by Chinese practitioners of blistering insects in cases of hydrophobia; and as I am not aware of the remedy being similarly used in Great Britain, it seemed to me that further attention should be paid by qualified men to a medicine which has a certain reputation in several parts of Europe for curing the bites of mad animals. Dr. Grisanowski, of this city, kindly informed me of its use in Russia and France, and has supplied me with information on the subject. It appears that about thirteen or fourteen years ago a certain Nikititsch Levachoff, of Peklitz (Government of Riazan, Russia) created a sensation by his cure of hydrophobia. His arcanum was supposed to be the *Cetonia aurata*, or rose beetle. The monks Phaneromenos, near Eleusis, Greece, use the insect *Mylabris biculata*, with equal parts of the leaves of *Cynanchum excelsum*, doses of 15 grains of the mixed powder; at the same time cauterize the wound with boiling oil. The physician of the King Otho, of Greece, often gave half-grain doses of cantharides until symptoms of incipient gastro-enteritis declared themselves. Here in Tuscany there are one or two persons who are reputed to be able to treat successfully the bites of mad animals, or of nostrum whose basis is supposed to be cantharides, or of unavailing, inasmuch as a medical man, to my knowledge, is not convinced of the efficacy of the remedy, and caused bottles to be prepared by one possessing the secret, and them, with a memoir, to the Academy of Medicine, and the box containing the remedy must have arrived at but a short time before the breaking out of the epidemic. It is probable that the whole matter has been set aside. Speaking of the remedy to the physician, I suggested that it contained cantharides, to which he assented, or at least some blistering fly entered into the composition. It occurred to me that I had once copied an ancient recipe for the cure of hydrophobia, and that out of curiosity I had retained

Probably the two compounds are identical. The formula in my possession was represented as a secret left by S. Donnino to the family of Boccaccio, and is represented by the following translation :—

Secret for Curing the Bites of Mad Dogs.

℞ Cloves	grains 54
Cinnamon	grains 54
Pepper	1 drachm and grains 36
Cantharides	grains 27. Mix.

Dose according to age :—From 25 years and upwards, grains 26; for 12 years, grains 19; for 10 years, grains 14; for 4 years, grains 6½; for 2 years, grains 3½.

It may be taken from the day of the bite up to twenty-five days after. The remedy must not be administered to pregnant women. It is to be taken in one dose according to age, as marked above, in wine, broth, or water, according to the taste of the sick person. It must be administered fasting, and the patient should not eat anything for at least four hours, and during this time should take a great deal of exercise, in order that the remedy should act the more. The patient will suffer strong pains in the head and kidneys, besides other inconveniences; even to the passing of bloody urine, should the dog have been really mad, and the blood have commenced to be contaminated. If at the height of the pain the patient would like to drink a glass of Nocera or Lettuccio water, it will serve him as a relief.

Remarks.—Tuscan grains have the value of 5 centigrams; consequently are less than the grain employed in Great Britain, Germany, etc. Nocera water is derived from a source in the Central Apennines, and Lettuccio water is the produce of one of the springs at Monteceline in Tuscany. It has laxative properties, and is less nauseous than many other purgative waters.

The *Cantharis vesicatoria* is found in several parts of Tuscany, its chief source being the Val di Chiana, where the peasants collect it by spreading cloths under the trees morning and evening, and shaking the insect out of the branches. The months of May and June are those in which the gathering takes place, and the fly prefers the olive-tree to the poplar and ash, which they also frequent. They are killed by being plunged into weak vinegar, or by being held over the steam of the same. Afterwards they are dried as rapidly as possible in the sun, and are frequently turned over by a thickly gloved hand, or by other means.

The CHAIRMAN said that if he were bitten by a mad dog, he would not like to trust to the remedy here proposed.

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BRITISH PHARMACEUTICAL CONFERENCE.
Dr. ATTFIELD read a paper on—

SOLUTIONS.

By T. B. GROVES, F.C.S.

A short discussion that ensued on the reading, before the Pharmaceutical Conference at Liverpool, of Mr. Rimmington's paper on "The Specific Gravity and the Actual Weight of Certain Volume Measures of Various Liquid Preparations," set me inquiring on the subject of the volume occupied by salts when dissolved in water.

The statement credited to the President by the reporter of the *Pharmaceutical Journal* is to this effect, "That the contents per oz. were coincident with the specific gravity; for instance, lemon-juice having a sp. gr. 1.040 would contain 40 grs. of citric acid per oz., and so on, except in such cases as alum and sulphate of soda, where there is much water of crystallisation. In those cases it would be half, or 20 grs. per oz."

Mr. Reynolds followed with the remark, that the same rule applied to sugar in diabetic urine, but properly qualified the assertion by the phrase "roughly speaking."

In the cases of both lemon-juice and urine, the estimation by that method must necessarily be exceedingly rough, as the variation of the proportions of other constituents affecting the specific gravity of the fluids are left out of the question entirely.

Although I have no new experiments to offer, I shall, I think, do some service, if I recapitulate shortly the facts I have obtained in the course of my recent reading on this subject. At least, serve to caution some who otherwise would be in place too implicit reliance on the "rough methods" already to.

Dalton, during the latter part of his life, occupied by the question of solution, and derived from his experimental supposed law, "that when a body dissolves, it will only occupy the volume of the solvent in proportion to the water of crystallisation it contains." His method of research involved the use of long vessels, and pouring backwards and forwards, in order to be incapable of giving accurate results.

This, as well as the want of general applicability pointed out by Hilton, whose volumometer, consisting of a flask with a long, narrow, graduated neck, enabled him to approach more nearly to accuracy of determination than whilst the theory approached correctness in the case of sulphate of magnesia and carbonate of

broke down in the cases of the naturally anhydrous salts, nitrate of potash, sulphate of potash, etc.

Walker found, to his astonishment, sometimes an expansion, sometimes a contraction of the whole volume of salt and water, according to the nature of the salt employed, and the strength and temperature of the solution. However, he does not appear to have commenced with very clear notions, for after repeatedly employing the terms "bulk" and "volume," he goes on to say, "I next proceeded to determine if the increase of volume had any relation to the specific gravity of the different substances, or if, when a known weight of salt was dissolved in water, the increase of volume was in proportion to the volume, as indicated by the specific gravity; and if so, the salt would dissolve without either expansion or contraction." Did he really expect an ounce of sulphate of magnesia, for instance, to occupy the same space as an ounce of water!

This method involved the use of a volumenometer. The one employed was not so well adapted for the attainment of accurate results as that of some other experimenters, but was, on the whole, far superior to that of Dalton.

Nitrate of potash was the first salt employed in testing the value of his new idea. The specific gravity of nitrate of potash being, according to his determinations, 2.074, one hundred grains of the salt would occupy the space of 48.21 grains of pure water. The calculated specific gravity would therefore be found thus:—100 grs. of salt being dissolved in 500 grs. distilled water—

$$\frac{100 + 500}{48.21 + 500} = \frac{600}{548.21} = 1.0944.$$

But the specific gravity ascertained by experiment was 1.1100, showing, according to him, a condensation amounting to 6.22 grain measures.

I certainly cannot deduce this amount from the data given, but make it 7.7 gr. m. However, the principle being established, it becomes possible when the ratio of condensation of a salt is known, to calculate the specific gravity of a solution within certain limits of accuracy—those limits being defined by temperature and degree of dilution.

The effect of dilution as exemplified in the case of a saturated solution of nitrate of soda is shown to be the following:—

If to 430 gr. m. of a saturated solution 60 gr. m. of water be added, the mass will suffer a decrease of volume of 1 gr. m. Sulphate of magnesia behaves in the same manner, and to the same

degree. Nitrate of potash suffers a diminution of .5 gr. m., under the same circumstances.

From a long and laborious paper by Messrs. Playfair and Joule describing a series of experiments undertaken in order to ascertain whether there really existed any similarity between solid and gaseous combinations, in respect of the law of equal or multiple proportions observed first by Gay-Lussac in the case of gases,—I propose to select those facts only that seem to have some pharmaceutical interest, and are possibly capable of practical application, omitting reference to the theoretical deductions therefrom further than to say that they have since been roughly handled by Professor Marignac, of Geneva, whose criticisms appear to me to well deserve consideration.

The volumenometer employed differed from that used by Holker, in that it had a tubulure in its side for introduction of salt, fitted with a ground-glass stopper. This admitted of the stem being of smaller diameter, and enabled the experiments to be attended with greater accuracy.

Unfortunately, however, the experimenters, whilst acknowledging the disturbing effects of temperature and dilution, seem to have adopted no systematic method of procedure as to the one or the other, unless it be true that the particular temperatures and dilutions adopted were selected because the results so obtained accorded best with certain theories sought to be established. This Professor Marignac evidently points at, though he does not actually affirm it. I may mention the case of sugar as being especially interesting to the pharmacist. The volume occupied by an equivalent of the substance = 172 grs., varies according to dilution between 99.00 and 108.06 grm., as follows:—

Ratio of Sugar and Water.	Temp.	Vol. in gr. m. of 172 gr. Sugar.
1 : 20	60	99.00
1 : 10	52	105.09
1 : 1	52	107.01
3 : 1	52	108.06

The temperatures here even are not uniform. I may observe when the ratio is 1 : 1, the sugar occupies a volume co-incident with that due to its specific gravity, 1.606. The investigation included the determination of a series of specific gravities and solution volumes of salts of every

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In compiling the following table I have selected a few only of special interest, considered pharmaceutically. The specific gravities are, in general, not those of Playfair and Joule, but those obtained by H. Buignet through the use of the air volumenometer invented by Regnault; and therefore, I consider, more worthy of acceptance. The term "specific gravity in solution," I employ simply to designate the weight of the solvent in air divided by the space it occupies in the solvent:—

Name of Salt.	Sp. Gr. in Air.	Sp. Gr. in Watery Solution.
Sulphate of Copper	2.302	2.77
" Soda	1.471	1.76
Biborate "	1.692	2.085
Chloride of Calcium	1.68	1.98
Potash Alum	1.757	2.135
Ammonia	1.653	2.00
Carbonate of Soda	1.463	1.58
Sulphate of Magnesia	1.675	1.96
" Iron	1.902	2.22
Nitrate of Potash	2.126	2.80
" Soda	2.265	3.22
Chloride of Potassium	1.986	2.80
" Ammonium	1.55	1.50
Bromide of Potassium	2.65	4.10
Iodide "	2.97	3.77
Chloride of Sodium	2.145	3.21
" Barium	3.081	4.42
Chromate of Potash	2.68	5.60
Bichromate "	2.624	3.35
Carbonate "	2.10	7.54
Bicarbonate "	2.18	3.00
" Soda	2.165	4.70
Oxalate of Ammonia	1.47	2.00
Sugar	1.606	1.608

Bearing in mind the irregularity that seems to attend all bodies, and mixtures of bodies, on the verge of change of state, and, therefore, confining oneself to solutions of mean condition, neither extremely strong nor excessively weak, it is possible by means of this table to ascertain beforehand, with tolerable accuracy, the effect of mixing definite quantities of a salt and water, and, *vice versâ*, of determining the proportions of both salt and water necessary to produce a given specific gravity. Thus, taking the case of sugar,—what will be the specific gravity of a solution containing equal parts of sugar and water? The volume of the water will, of course, be 1, the volume of the sugar $\frac{1}{1.606}$, the total volume being 1.6218. Dividing the total weight=2 by this, we get the specific gravity=1.23.

According to the table in Watts' "Dictionary," the specific gravity of a solution containing 50 per cent. of sugar, is 1.2166 at the temperature 63.5°. Proceeding in the same way with chloride of sodium, we get for a solution containing 20 per cent. of salt, the theoretical number 1.159, the experimental number being 1.1511.

Sulphate of magnesia gives for a 30 per cent. solution 1.172 theoretically, 1.1536 experimentally, the temperature in the latter case being 72.4° instead of 60°, which accounts, doubtless, for the comparatively large discrepancy. A solution of specific gravity 1.72 would, at that temperature, contain 33.5 per cent. of salt.

To determine the necessary proportions of salt, or other soluble substance, and water in order to produce a given specific gravity is not quite so simple. In order to avoid having two unknown quantities, we will assume the quantity of water to be known. Let it be 10. It is required to ascertain the quantity of sugar necessary to produce with that amount of water a syrup having the specific gravity 1.20. The specific gravity of the water is, of course, 1.00: the specific gravity in watery solution of sugar, 1.608. The symbol x represents the unknown quantity we have to ascertain. Then

$$\frac{10}{1} + \frac{x}{1.608} = \frac{10 + x}{1.2} = 7.89.$$

i.e. to produce a syrup of specific gravity 1.20, 7.89 parts of sugar must be added to every 10 parts of water. Such a syrup ought theoretically to contain 44.1 per cent. at 60°. According to the table in Watts' "Dictionary," a syrup of specific gravity 1.2057 at the temperature 63.5° should contain 42 per cent. of cane-sugar.

The theoretical considerations involved in the phenomena of solution are so numerous and interesting, that I propose some day to resume the subject I have now merely scratched on the surface, as it were; in which case I will ask again to be permitted to bring the subject before the notice of the Pharmaceutical Conference.

The CHAIRMAN said that this was a very interesting paper, and confirmed some of the views he held on the same subject.

PRESERVATION OF MEAT.

Dr. PAUL, F.C.S., gave a short description of a new method of dealing with meat, which he had recently had an opportunity of studying. Every one present would be aware that in the only successful mode of dealing with South American meat,—in

the preparation of Liebig's extract,—the great mass of the feeding portion of the meat was wasted ; in fact, instead of producing food, they merely produced a material which was a kind of stimulant, the whole of the fibrine and albumen being lost. Some experiments had been made by the inventor of a process to which he would now refer, with the object of drying the meat by pressure ; and he had found, what a great many other people had found who had endeavoured to express from any organised structure the water or liquid it contained, that he could only succeed very imperfectly. However, Mr. Henley, the inventor of this method, had, by submitting meat to hydraulic pressure, succeeded in removing from it about one-half of the juice contained in the tissue. That juice was a liquid containing the constituents of the ordinary extract of meat made on Liebig's plan of infusing the meat in water, and it also contained all the soluble albumen. Its specific gravity, as it ran from the hydraulic press, was about 1·030, and it yielded on evaporation about 8 per cent. of a perfectly dry residue. Of that residue, five parts out of the eight were albumen ; and if the juice were heated up to about 100°, to coagulate the albumen, they got a pale liquid which might be boiled down, and then gave as residue the ordinary extract of meat. Another plan of dealing with this expressed juice was to evaporate it at such a temperature as would not coagulate the albumen, and add a small quantity of gelatine : it could then be converted into portable soup, put into bladders, and preserved in that condition for a great length of time. But the principal object of the process was to deal with the residual pressed meat, from which half the juice and half the water had been expressed, and also about half the soluble albumen and other constituents contained in the ordinary extract of meat, so that the residual pressed meat was actually richer in nutritive constituents than the original meat. If this pressed meat were submitted to further drying by heat, it might be reduced to a state in which it would contain about 10 per cent. of moisture, and meat in that state would keep for almost any length of time. He had hoped that he might have had some samples sent down in order to let the members see what could be done with these products : there were three—the dry beef, the prepared beef-juice, and the ordinary Liebig's extract.

The CHAIRMAN said he thought that the system of preserving meat explained by Dr. Paul, if it would really keep a long time, was likely to be a very valuable one. It was popularly supposed that Liebig's extract, of which so much was sold, was really a feeding commodity, whereas it was not so, but it acted as theine acted in tea,

—it prevented waste of tissue, and consequently was rather stimulating than nutritious. But in the plan referred to by Dr. Paul, where you have still 50 per cent. of the *extractum carnis*, combined with all the nutritive ingredients of the meat, the product has more the character of a true animal food.

Mr. HANBURY (London) said that this reminded him of a subject which was brought up at a meeting of the Royal Society of London a few weeks ago, when Dr. Simpson took occasion to remark that at a large London hospital with which he was connected, the beef-tea was prepared so as to contain almost the whole of the solid matter of the meat. The beef was first infused, and then the meat that had been used the previous day, and from which the infusion had been strained off, was reduced to a sort of pulpy state, and mixed with the fresh infusion. It was stated that this plan produced most excellent results, and it had been in vogue for some years, to the general satisfaction of the medical officers and of the patients.

Mr. DEANE (London) said he had had some experience in regard to Liebig's extract of meat. He found that after separating the matter which was soluble in water at a temperature which would coagulate the albumen, the residue was left in a very insoluble and indigestible state. He had come to the conclusion that meat fibre that had been deprived of the phosphates and chlorides that were held in the juice of the meat among the fibres could be of no manner of use, and he should therefore infer that the meat prepared by pressure, from which half of the soluble salts had been removed, would be a very indigestible substance. Liebig's extract was a restorative under certain conditions, but it would be a mistake to suppose that it possessed all the nourishment of the meat from which it had been taken. When any of them found themselves exhausted, it was because the muscular system was deprived of some of its constituents, and it was a remarkable fact that when a person was so exhausted, if he got a small quantity of Liebig's extract, say half a dram in hot water, in the course of ten minutes a wonderful restoration took place. He had a suspicion that if they had the pressed meat referred to, with half of the matter removed, it would not do for weak stomachs like his own, which required a little more of the extract. These were the chief points which he had to mention. He had paid a great deal of attention to the process, and he had instructed a gentleman who went out to the Australian Meat Company as to the proper method of preparing the extract. That gentleman went and carried out his (Mr. Deane's) instructions very generally, and the result had been very successful. In regard to

cooking, there was no necessity for boiling meat or fish rapidly; for if a little time were allowed there would be better results.

Mr. SAVAGE (Brighton) said that this subject had been under consideration for the Sussex County Hospital. The extract of meat had been used there, and it seemed to answer uncommonly well.

Professor ALLEN said he could endorse the remarks that had been made as to Liebig's extract being a stimulant. He had taken it in a glass of wine and it had a restorative effect. Some people objected to the flavour of it, and some said it had a burnt taste. He could not say that it had that taste; but he used plenty of pepper with it. He thought that the preparation of meat sold by Fortnum & Mason, Piccadilly, was uniformly prepared. It was in the form of a sausage, which was enough to make a basin of soup.

Mr. ATKINS said he had recently observed one or two striking cases of the nutritive quality of Liebig's extract. He had found that slices of toast covered with Liebig's extract were more effectual as a restorative than anything else he was aware of. He would like to know whether the opposition of medical men to Liebig's extract was gradually yielding. There was an opinion among them that it was deficient in some of the important qualities required in beef-tea.

Mr. MACKAY (Edinburgh) said he could bear testimony to the value of Liebig's extract when made into beef-tea. Several very striking instances of its worth had come under his own observation; especially with regard to two persons who had derived great benefit from it. One was a lady advanced in life, and the other a young man, both given up by their medical men, and they were about to sink from sheer want of nourishment. They had taken a dislike to everything that was named to them, and at length it was suggested to them that they should take Liebig's extract, from which they got the greatest advantage. He had often heard medical men speak of the stimulating and nourishing effects of the extract. He had known instances of gentlemen who were out on the moors, and by spreading a biscuit or toast with the extract, it had enabled them to go through almost any amount of fatigue.

Professor WRIGHT said that the prevailing opinion was that the extract did not do so much to prevent muscular waste as to enable the digestive organs to act more perfectly on the food materials and cause less waste than would be the case were the semi-alkaloids not present.

Mr. COLLINS (London) said that a friend of his travelling in South America never went out without Liebig's extract; and when he was

exploring there was nothing which gave him so much strength. He was sometimes days without any other food whatever.

Mr. SCHWEITZER (Brighton) said he had made some beef-powder. It had the same appearance as coagulated albumen, and nothing would soften it.

Dr. PAUL then replied. He said that as to the preparation of Fortnum & Mason, he believed it was a kind of portable soup made by partial evaporation of beef juice and the addition of a little gelatine. It was not his intention to speak of meat extract as a stimulant. If a man took small quantities of extract of meat when working hard it might for a time sustain him, but that was no proof that it was food. He might be living on his own body. It was true that the pressed meat was not to be compared with a fresh beefsteak, but that was not the question at all. All meat-preserving methods were intended to utilize a quantity of meat that would not otherwise be used. It had been pointed out by Liebig that one of the greatest defects in preparing his extract was that it left the great mass of the animal utterly worthless. It required thirty pounds of beef on the average, and of the better parts, to produce one pound of the extract, and the other twenty-nine pounds were entirely waste. The real way of considering the method he had brought under their notice was to compare it with the other methods intended to attain a similar result. It might well be that since the pressed meat contained less of the juices than fresh meat, it might be less digestible and less valuable as food, but that was still more the case with salt junk. He thought that this new method of dealing with meat was one worth attention and observation, whatever might be the actual nature of the results.

PROTECTION TO BOTTLERS.

Mr. BAILDON (Edinburgh) exhibited a guard to be put upon bottles, for the protection of men engaged in bottling aerated waters. He had no doubt this ingenious contrivance of Mr. Fraser would be interesting. It was a very efficient protection to the bottlers, who often had their hands and arms severely cut. He had had practical experience of the plan himself, and he could say that it was very simple and afforded very efficient protection.

The Conference adjourned at four o'clock, to meet next day at eleven.

Wednesday, August 2.

The Conference met on Wednesday morning at eleven o'clock ; W. W. STODDART, Esq., presiding.

Mr. HANBURY read a paper on—

THE CRYSTALLINE PRINCIPLES IN ALOES.

By Dr. F. A. FLÜCKIGER.

Professor of Pharmacy and Pharmacognosy in the University of Bern.

A large sample of *Natal aloes*, a variety of the drug remarkable for its opacity and pale tint has been presented to me by my friend Daniel Hanbury. Thin fragments of it are so little translucent as to show but a faint brown colour. The fracture of large lumps exhibits a dense conchoidal surface of a dull greyish brown or drab, marked with a few yellowish veins, and quite devoid of the brilliant vitreous gloss exhibited by newly broken Cape aloes.

Fragments freely moistened with spirit of wine, when examined microscopically, especially in polarized light, are seen to consist of numerous crystals imbedded in a yellowish amorphous mass which is readily soluble. Mr. Hanbury first observed that the crystals on the other hand are but sparingly soluble and that when the crude drug is treated with spirit of wine they separate as an almost whitish deposit; he consequently suggested they might be something different from aloïn. These crystals as they occur in *Natal aloes*, are not well defined; most of them are thin, short prisms, sometimes tufted, as in aloïn from hepatic aloes. Sometimes also single, tabular, probably rectangular crystals are met with, as may be seen by gently crushing a fragment of the aloes with glycerine between two glass-slides.

There is no difficulty in separating the crystals from *Natal aloes*. If the drug is rubbed with an equal weight or a little less, of spirit of wine at a temperature not exceeding 120° F., the amorphous portion of it is dissolved. The remaining crystals may be collected on a filter, and washed with a small quantity of cold spirit. From 16 to 22 per cent of crude pale yellow crystals can thus be got.

The difficulties begin when the purification of the crystals has to be effected. For this purpose I have tried the usual solvents without discovering any liquid that is thoroughly convenient for dissolving my *Nataloïn*, for by this name I propose to designate the substance. Neither water, benzol, bisulphide of carbon, petroleum-ether, chloroform, or ether, is capable of dissolving nataloïn in appreciable quan-

tity. A mixture of ether (1 part) and spirit of wine (3 parts) succeeds a little better; the same may be said with regard to anhydrous acetone, methylic and amyl alcohol, glacial acetic acid and acetic ether. After all, however, I do not feel convinced of the advantage of any one of those solvents over common spirit of wine, of which 70 parts dissolve at about 60° F., one part of nataloin, or of the above-named mixture of ether and spirit, 60 parts; while of methylic alcohol 35 parts, of acetic ether 50 parts, of ether 1236 parts, and of absolute alcohol 230 parts, are respectively required for dissolving one part of nataloin.*

Nataloin in small crystals is rather more intensely yellow than flowers of sulphur; larger crystals display a somewhat orange tint. Its taste is pure bitter, neither a sweetish nor an acrid after-taste being observable.

In warm or hot spirit of wine nataloin is scarcely more soluble than in cold. By heating the liquid even gently, it quickly turns darker, assuming a red colour, so that some decomposition is evident, nor can it be wholly avoided by evaporation *in vacuo*. The best method of recrystallising seems to be that of heating the nataloin with 60 or 70 parts of spirit of wine to 100–120° F., and allowing the solution thus obtained to evaporate spontaneously during several weeks; in this way may be got crystals of $\frac{1}{2}$ to $\frac{1}{4}$ a millimetre long.

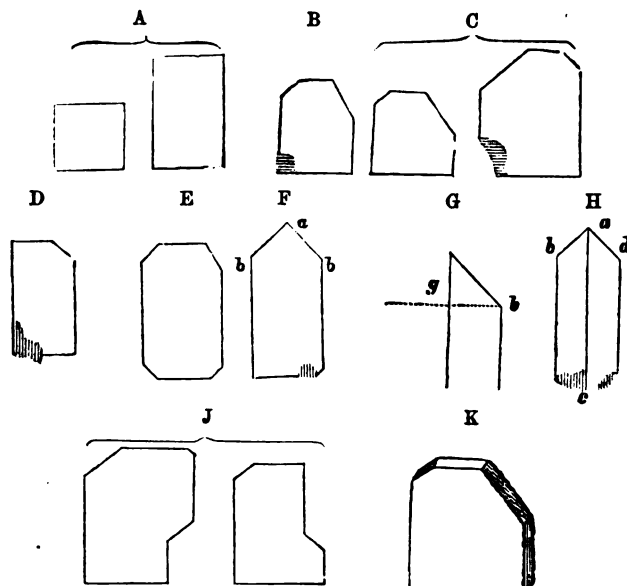
The crystallographic features of nataloin are very characteristic. The small, first-deposited crystals, as well as the larger ones, always consist of extremely thin and brittle scales, not resembling the crystals originally found in the drug. The most perfectly developed crystals of nataloin are square, or at least rectangular scales (A), but two of their angles are usually more or less truncated (B). The amount of truncation of the angles is usually not the same on both sides (C), and is even sometimes restricted to one only (D). Crystals having all their four angles truncated are rarely met with (E), and pointed scales like F are still more exceptional.

Nataloin, which has been quickly deposited from a warm alcoholic solution, shows a predominance of the form indicated in fig. G, and sometimes also in fig. H, which is striated lengthwise. The latter seems, therefore, to be rather a combined figure than an individual crystal.

If the scales H are examined in polarised light, the two parts

* Mr. Edward Histed, of London, who had been occupying himself also in the examination of Natal aloes, considers methylic alcohol to be by far the best solvent for nataloin.

namely, $a b c$ and $a d c$ are sometimes different in the direction of their refracting power,* which, in nataloin, is always brilliant. Finally, there are also found irregularly developed crystals (J).



The crystals of pure nataloin being usually so small, their angles can only be measured approximately by means of the microgoniometer. Some estimations not quite satisfactorily ascertained, furnished me 82° for the angle a , and 139° for angle b . The crystals are easily broken according to their longitudinal direction $a c$, for instance, in fig. H; yet still more so in a direction parallel to their surface. If an alcoholic solution evaporates very slowly, tabular crystals of appreciable thickness can be obtained, yet in a less pure state. If they happen to be a little injured, their longitudinal edges exhibit a distinct lamellar structure, as shown in fig. K. Crystals of this kind are chiefly formed from a solution in acetic ether. An alcoholic solution yields mostly regular square scales.

Nataloin gives off no water when exposed over concentrated sulphuric acid, or when heated to 212°F ., in either case even for some days; and this behaviour shows at once that it is not identical

* This, however, may quite as well be due to the occasional superposition of extremely thin scales. A A are crystallised from absolute alcohol; B, C, D, E, F, J, from spirit of wine slowly grown; G, H, quickly separated from spirit of wine; K, from acetic ether.

with the aloin discovered by Messrs. Smith of Edinburgh, and examined by Dr. Stenhouse. According to this chemist, crystallised aloin parts with 2.69 per cent. of water when dried over sulphuric acid, and entirely loses its crystalline aspect when kept for some days over a water-bath. Nataloin is not even altered, or its weight diminished, if it is heated to 284° F. Decomposition begins to take place only towards 320° F., when the nataloin turns greyish; the temperature named having been maintained for many hours, the loss of weight amounted only to 3.8 per cent. At 356° to 374 F. nataloin fuses, becoming previously of a dark, brown red, but is still partially crystallisable, as may be ascertained by treating it with solvents.

Nataloin is soluble in concentrated sulphuric acid; the orange liquid yields a precipitate by addition of a small quantity of water, but the dingy colour of the nataloin so obtained probably shows that partial alteration has taken place. If the vapour of fuming nitric acid is cautiously directed on to a solution of nataloin in sulphuric acid, the latter acquires a fine green colour, quickly changing to red and blue. This very intense and distinctive reaction which was first pointed out by Mr. Histed, may be illustrated as well by rolling a crystal of saltpetre in the sulphuric solution. A small grain of chlorate of potassium produces a brilliant green zone, almost instantaneously disappearing. Nitrate of bismuth gives nearly the same effect. Bichromate of potassium acts in a similar manner as with strychnine, only that the colour is less pure. *Natal aloes* being so rich in nataloin, itself displays these reactions, by which, in fact, it may be easily distinguished from the *aloes* of the *Cape*, *Zanzibar*, or *Barbadoes*.

By heating nataloin with nitric acid of about sp. gr. 1.3, to 140°-160° F., a red solution is obtained, which at length turns yellowish as the nataloin slowly disappears. But I have not been able to discover in this liquid either picric or chrysamminic acid, yet the latter, according to Stenhouse, is formed when aloin and nitric acid are heated together. Nataloin yielded me only oxalic acid.

I have made five analyses in order to ascertain the elementary composition of nataloin. By burning it in a current of oxygen:—

I. 0.2025 gramme yielded 0.4380 carbonic acid, and 0.1125 water.

II. 0.2450 gramme yielded 0.5325 carbonic acid, and 0.1372 water.

III. 0.2288 gramme yielded 0.5135 carbonic acid, and 0.1215 water.

IV. 0.2605 gramme yielded 0.5578 carbonic acid, and 0.1395 water.

V. 0.1598 gramme yielded 0.325 carbonic acid, and 0.0898 water. These results answer to the following percentages:—

	I.	II.	III.	IV.	V.
Carbon . . .	58.99	59.14	61.18	58.38	60.15
Hydrogen . .	6.17	6.24	5.92	5.95	6.24

The average numbers of these would be—

Carbon	59.56
Hydrogen	6.10

The crystals analysed were taken from different crops, and dried at 212° F., except those burnt in analysis V. The latter were the purest and largest crystals I have ever obtained; I dried them some days over sulphuric acid, and then exposed them to 212° F. only for a short time. The analysis of these crystals appears to me, on the whole, to be the most trustworthy; its results would lead to the formula $C_{34}H_{38}O_{15}$, viz.:—

34 C	408	59.47
38 H	38	5.54
15 O	240	34.99
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	686	100.00

Both the analysis V., as well as the general average, agree tolerably well with this formula. Now the same formula is assigned by Stenhouse to his crystallised hydrated aloin. Deprived of the molecule of water H_2O , anhydrous amorphous aloin of Stenhouse contains carbon 61.07, and hydrogen 5.39, with which only my analysis III. would agree. There is, however, one fact perhaps, which might speak in favour of the *higher* percentage relating to carbon; that is the composition of the *drug* itself, which I found to be *less rich* in carbon than its crystalline principle. I submitted 0.2645 gramme of Natal aloes (dried at 212° F.) to elementary analysis equally by means of oxygen, and obtained 0.5365 carbonic acid, and 0.1385 water. The drug consequently contains 54.63 per cent. of carbon, and 5.80 of hydrogen.

Stenhouse, in assigning the above formula to crystallised aloin, or rather $C_{34}H_{38}O_{14}$ to the anhydrous aloin, was well entitled to do so by the existence of the crystallised bromine compound $C_{34}H_{30}Br_2O_{14}$, which he discovered. Yet as to the nataloin, I have failed to obtain a well defined bromine compound. If bromine is added to nataloin, heat is evolved and bromine evidently absorbed. The orange mass

then proves much more readily soluble in spirit of wine than nataloin, and also in methylic alcohol; but the solutions yield no crystals, either by slow evaporation, or an addition of water. I further enclosed, in a sealed tube, nataloin with a sufficient quantity of bromine, and heated the tube for many days at 212° ; but notwithstanding the partial absorption of the bromine, this method, too, proved not more satisfactory. I have, therefore, not further examined the bromine compound. Iodine appears to be incapable of uniting with nataloin.

Some crystallised compound, or well defined product of decomposition of nataloin, would alone afford the facts for settling its formula. After the unpromising trials with bromine and iodine, I have attempted to arrive at better results by boiling nataloin with dilute sulphuric acid. This was done in a tube previously filled with common illuminating gas, and then sealed in order to exclude the influence of air. The liquid nevertheless turned dark purplish; it was slowly evaporated after it had been saturated with carbonate of barium. A new body then made its appearance, consisting of colourless very thin feather-like crystals. But this body was always formed in a very trifling quantity only, so that I have not been able as yet to isolate it;* it dissolves in methylic alcohol, and all the above liquids as well as the accompanying products of decomposition. A similarly unpromising result was obtained by gently warming zinc, dilute acetic acid, and nataloin. The latter then becomes greenish, and is at last dissolved; if the zinc is separated by means of sulphuretted hydrogen, the liquid, on evaporating, turns likewise purplish, tastes no longer bitter, but gives only traces of a crystallised body resembling that formed by the action of dilute sulphuric acid.

By a mixture of nitric and sulphuric acids, both concentrated, no available compound of nataloin is formed.

In alkaline liquids, nataloin is also soluble, but very quickly darkened; by dry distillation, yellow or brown oily acid liquids are produced, which are devoid of any peculiar aromatic odour.

The whole of the foregoing facts do not yet allow us to form an idea of the constitution and the true chemical nature of nataloin but they are sufficient to prove that it is a new body, certainly differing from the aloin hitherto known, although in percentage composition there is no considerable discrepancy between the two principles,—probably none at all.

* Perhaps one of the products of decomposition of aloes, alluded to by Rochleder in 1861 and 1863?

I have also received from London some aloes, which I am informed had been imported from Zanzibar, and was offered for sale in 1867. This drug is of a pallid, reddish-brown hue, and so highly crystalline, that it might fairly be termed *crude aloin*. Mr. Hanbury is of opinion that it is not distinct from the so-called *socotrine aloes*, but that it is formed by the spontaneous drying up of the more crystalline portion which settles down when fluid socotrine aloes is allowed to repose. He assures me further, that he has noticed that the solid Zanzibar aloes which is imported, though but rarely, in skins, is partly glossy and transparent, and partly highly crystalline.

Whatever may be the true facts, the crystals of the Zanzibar drug are comparatively large prisms, such as I have never observed in nor obtained from Natal aloes; and the pale, dull liver colour of the latter is extremely dissimilar to the reddish hue of the Zanzibar sort. The crystals of Zanzibar aloes cannot be so easily isolated as nataloin, because their solubility approaches much nearer that of the amorphous part of the drug. They may, however, be obtained by water or dilute alcohol in the manner pointed out in the several papers of Stenhouse, Smith, and Groves, for the preparation of aloin. Mr. Histed, who has been kind enough to send me some good quantities, obtained his crystals by moistening the powdered crude drug with alcohol, sp. gr. .960, and strongly pressing the pasty mass in several thicknesses of calico; then dissolving the yellowish crystalline residue in warm, weak alcohol, collecting the crystals which form by cooling and repose, and purifying them by recrystallisation.

Aloin from Zanzibar aloes is usually less bright in tint than nataloin, the crystals being smaller and not well developed. The crystallographic character of Zanzibar aloin is different from that of nataloin, the former consisting of what I cannot as yet better designate than as *tufted needle-shaped prisms*. The best solvent for them appears to be methylic alcohol, from which I find that very good crystals, 2 to 3 millimetres long, and nearly 1 millimetre broad, can be obtained. Zanzibar aloin is much more soluble than nataloin. At ordinary temperatures, 30 parts of spirits of wine, 9 parts of acetic ether, 380 parts of (sulphuric) ether, and 90 parts of water, are capable of dissolving respectively 1 part of the said aloin, while in methylic alcohol it is most abundantly soluble. These numbers sufficiently illustrate the dissimilarity of the bodies under examination. But there are yet other points of difference. In concentrated sulphuric acid, Zanzibar aloin is soluble; but on addition of an oxidizing substance, as nitric acid, no alteration of the

yellow colour of the liquid takes place, as when nataloin is similarly treated.

The taste of the two substances is a little different, Zanzibar aloin imparting at first a slight sense of sweetness (quickly followed by pure bitter) not perceptible in nataloin.

Again, the Zanzibar aloin contains water, which it gives off over concentrated sulphuric acid. The air-dried substance lost in several days from 11.7 to 12.4 per cent., and on exposure to the open air again absorbed slowly about the same quantity of water. The air-dried aloin kept at 212° F. for ten days lost 14.5 per cent.; the loss of weight amounted to only 13.2 per cent. if it was heated at 320° (160° C.) for some hours only. I have repeatedly performed these experiments relating to the amount of water which is contained in the air-dried substance, because it is again very different from Stenhouse's statement concerning his aloin. His aloin, $C_{34}H_{19}O_{15}$ (old way of writing), loses only 2.69 per cent. of water, when dried at 212° F. for some hours, and not 11 to 12 per cent. like mine obtained from Zanzibar aloes.

Yet, as to the elementary composition, that of my *anhydrous* substance agrees with that of Stenhouse's *crystallised hydrate* as nearly as possible. He gives the following numbers* for aloin dried *in vacuo* :—

		Calculated.	I. analysis.	II.
34 C	2550.0	59.47	59.39	59.24
19 H	237.5	5.54	5.97	5.79
15 O	1500.0	34.99		
		<hr/>		
		100.00		

On the other hand, 0.2108 gramme of the aloin prepared by Mr. Histed from Zanzibar aloes, which I dried three days over sulphuric acid until its weight was no longer diminished, yielded me 0.4576 carbonic acid and 0.1128 water: that is to say, it contains carbon 59.20, and hydrogen 5.94.

Thus, adopting the *new atomic weights*, we have—

		Calculated.	Stenhouse. (Average.)	Flückiger.
34 C	408	59.47	59.3	59.2
38 H	38	5.54	5.9	5.9
15 O	240	34.99	—	—

But Stenhouse admits his aloin to contain 1 mol. of water, and consequently assigns to it the formula $C_{34}H_{38}O_{14} + H_2O$, whereas

* *Phil Magaz.* xxxvii. (1851) 481 *et seq.* Gmelin's "Chemistry," xvi. (1864) 461.

my analysis relates to a body, which, as it has been dried over sulphuric acid, I regard as anhydrous. By the heat of the steam-bath it further loses about 3 per cent., but I think this loss rather depends upon decomposition, the substance assuming a somewhat darker coloration. These suggestions are confirmed by the above statements, which showed that air-dry aloin from Zanzibar aloes loses over sulphuric acid 11 to 12 per cent. of its weight. If we suppose, as we are well entitled, this loss to consist of water, we may then attribute to my substance, air-dried, the formula $C_{24}H_{28}O_{15} + 5H_2O$; it would require 11.59 per cent. of water, a number closely enough agreeing with my actual observations, as has been shown.

I have been unable to prepare from the Zanzibar aloin the crystallised bromine compound (bromaloin) which appears so easily obtainable from the aloin of Barbadoes aloes.

The reaction of nitric acid on the two aloins is also distinctive. With the latter a deep red colour is produced, not manifested by the former, nor by nataloin. All these facts lead to the conviction that the aloin extracted from Zanzibar aloes, is not only distinct from nataloin, but also from the aloin obtained by Messrs. Smith from Barbadoes aloes. I nevertheless do not think it desirable to give another name to the aloin furnished by the Zanzibar drug, until further investigation has been made.

One fact, at all events, results from the above researches, namely, that there occurs in aloes more than one crystalline principle.

Mr. ALFRED W. P. SMITH then read a paper by Messrs. T. and H. Smith, entitled "Notes on Aloin."

NOTES ON ALOIN.

MESSRS. T. AND H. SMITH.

(Abstract.)

At the previous meeting of the Conference, in Liverpool, some Notes on Aloes were communicated by Dr. Tilden, in the course of which he drew attention to and supported the opinion of Robiquet (*Journ. de Pharm.*, tome xxix.), that the purgative property of aloes was not due to aloin. In the *Pharmaceutical Journal* for November 19, 1870, Messrs. Smith stated that the employment of aloin, as a cathartic, had increased from a few pounds to many thousand ounces yearly, and that they could obtain the evidence of medical practitioners in confirmation of their original statement, that the active principle of aloes was aloin. In the following number of the

Pharm. Journ. (Nov. 26, 1870), Dr. Tilden held to the conclusion that, so far as could be ascertained at present, the soluble brown uncrystallisable substance which constituted a considerable proportion of all aloes was the part to which the purgative power was to be referred. At the present meeting Messrs. Smith adduced the evidence they had before alluded to in support of the cathartic character of aloin. From the *Monthly Medical Journal* of 1852, they read an amusing colloquy between Professors Simpson, Syme, Gregory, Christison, and Bennett, which bore favourably on the point, and referred to similar allusions in *Milne's Materia Medica*, *Parrish's Practical Pharmacy*, *Neligan's Materia Medica*, and other works; quoting also McKendrick's "Experimental Notes on the Action of Aloes," *British Medical Journal*, July, 1871. They read portions of letters from a number of gentlemen engaged in medical practice, who had frequently used aloin as a purgative, and several of whom considered it to be about four times the strength of good Barbadoes aloes. With respect to the effect of aloin on horses, some veterinary authorities were cited: one gentleman stating that, from experience of its use from time to time among a stud of thirty horses, he considered it to be three and a half times the strength of the Barbadoes drug, than which it acted somewhat more quickly, and produced less sickness and "dulness." 2 drachms, with 1 of ginger, gave a very small and useful bolus.

In conclusion, the authors expressed their desire to contribute any information that would aid in the elucidation of the chemistry of aloes.

The CHAIRMAN said that the two papers just read were very valuable, and he hoped they would elicit remarks from those specially acquainted with the use of aloes. As to the crystals, it seemed strange that from different kinds of aloes different crystals should be formed. He would like to know from Mr. Smith if he had noticed any difference in the actual measurements. The shapes might apparently be different; but in what appeared to the inexperienced eye a mass of crystals, there would be found two predominating angles. He believed it was possible to measure such crystals to a great nicety; and he would suggest to Messrs. Smith that they should kindly have the angles of their crystals measured, and so ascertain whether there was much difference between the aloin from the different kind of aloes. They did not use aloin in the West of England to the extent that it was used in Edinburgh and the North. He had no doubt of the activity of the aloin as a purgative, but he would like to know if observations

had been made as to the relative use of it. In the West of England they were gradually going round to the idea that the Barbadoes aloes were the best to use. When he heard Mr. Smith say that there was more aloin to be obtained from the Barbadoes aloes than the others, he thought that was a further proof in support of Mr. Smith's assertion that aloin was a purgative.

Mr. A. W. P. SMITH said that aloin had no pretensions to anything superior to aloes other than activity. The great advantage of aloin over aloes was its reliable character, and that it was always to be trusted. The variable character of the crude drug was a great drawback.

Mr. T. SMITH replied to some statements on the subject which appeared in the *Journal de Pharmacie*, and maintained that aloin was of great value.

Mr. WILLIAMS said it was very important they should know that different kinds of aloes yielded different kinds of crystals. He would like to know more about the different crystals produced from the various aloes of commerce. He had no doubt that the Messrs. Smith could furnish the information. He himself had manufactured aloin, and he had found great difference in the yield; but the best yield was from the Barbadoes.

Professor ATTFIELD made some confirmatory remarks respecting the way in which the apparently contradictory statements as to the activity of aloes and aloin might possibly be found to harmonize. Bodies alike in appearance, coming from the same source, and closely allied in chemical composition, were known to possess very different physiological properties. Thus Matthiessen and Wright's apomorphia had medicinal characters entirely different from those of morphia, but varied in chemical composition only to the extent of the elements of one molecule of water. Again, there were strong grounds for believing that codeia was a similar structure to morphia, except that one of the hydrogen corner-stones, so to speak, had been taken out, and a methyl stone put in its place. Nay, similar modifications produced non-poisonous from poisonous compounds. Thus kakodylic acid, which contained as much arsenicum as was present in arsenic acid, had no effect on rabbits, and probably none on man. Hence he would not be surprised to find that different, or even similar, kinds of aloes contained different modifications of aloin varying in medicinal activity. This hypothesis might turn out to be valueless, but with such workers as Dr. Flückiger, the Messrs. Smith, and Dr. Tilden, and the discussion of the matter by such gentlemen, there was no doubt that the truth must sooner or later be unveiled.

ladies ; and though they could not take aloetic pills, so called, they could take aloin pills with the greatest comfort. From what he had seen, there must be great advantage to some persons in the use of aloin. Altogether he thought the subject one well worth further investigation.

Dr. ATTFIELD said he would like to ask the Messrs. Smith or Dr. Cook if they could enlighten the members as to the constitution of aloin.

Dr. COOK said that at present he had no information on the subject ; but he hoped they would in time arrive at some kind of chemical decision on the matter.

Mr. A. W. P. SMITH said that Mr. Hanbury remarked that Dr. Widen's idea about the activity of aloin was that it was little used because it was of little use.

Mr. HANBURY.—Little used according to *his* (Dr. T.'s) observation.

Mr. SMITH said it seemed strange for those living in the North to hear such a statement, because he did not think there was a dispensing chemist in the whole of Scotland that had not aloin in his stock. It appeared to him that those living in the South were far behind in the matter of aloin.

Dr. PROCTER said that he had used aloin himself with considerable advantage and success, and greatly to the comfort of his patients ; but he must also say that he felt satisfied that the resinous matter had a purgative effect. He had used the resinous matter, and had found it to be an aperient. He found that while the aloin acted without any unpleasant feeling, the resinous matter did produce very unpleasant effects indeed.

Mr. A. W. P. SMITH.—Is it not possible that there might have been some active aloin with the resin ?

Dr. PROCTER.—That seems to me a matter of dispute.

Mr. T. SMITH.—It is possible that some aloin might have been in it, the resinous matter not being readily exhausted.

Mr. BOTTLE said it appeared to him that aloin had not the same medicinal effect in the South as it had in the North. Mr. Smith would perhaps remember, twenty years ago, that he called on Mr. Bottle at Dover, and that aloin was introduced there. The use of it was not, however, satisfactory ; and he had still the remnant of that very stock which he bought from Mr. Smith. It was possible that he was not supplied at that time with the article which Mr. Smith manufactured now-a-days.

LINSEED AND LINSEED MEAL.

BY THOMAS GREENISH, F.C.S.

Although the linseed meal poultice is by no means a modern invention, yet the first mention of it (*Cataplasma Lini*) occurs in the Pharm. Lond. of 1836, where it is directed to be made with *bruised linseed (sem. lini contriti)*; and the same applies to the Pharm. of 1851; but in the Pharm. Brit. of 1867, the terms used are linseed meal, and the explanation which accompanies it is "the cake of linseed, from which the oil has been pressed, reduced to powder." In some establishments to this day a crushed linseed is kept for sale to the public. It has, however, been found that this seed is too rich in oil to be kept long in such a condition, as the oil it contains, when so exposed to the atmosphere, rapidly oxidizes, and acquires a degree of rancidity which is very injurious when the poultice made from it is applied to open wounds. In consequence of this defect, it has become the custom of the trade to use a much less oily article, which is simply the meal produced by grinding and sifting the dry linseed cake of commerce. The directions respecting this article of the Materia Medica, found in the last edition of the British Pharmacopœia, 1867, attempt to solve the difficulty by directing the *powdered* linseed cake to be mixed with olive oil, in the proportion of two fluid ounces to the pound, when sent out for use, which is necessarily a very inconvenient practice.

In addition to the inconvenience caused by this oxidation of the oil, another has arisen by reason of the impurity or adulteration of the linseed cake, from which the "lini farina" is produced; and it is the object of this paper to point out how the difficulties may be avoided, and a true "lini farina" be prepared; which, while it keeps well in the pharmacy, will also meet the requirements of the Pharmacopœia, and act efficiently when sold to the public.

It being one of the objects of this Conference to direct attention to adulterations, it becomes the duty of its members to point them out, and, if possible, to prevent them. This remark applies with force in the present case, as the "lini farina" enters into the composition of no less than five preparations of the British Pharmacopœia.

The result of any investigation of this subject must necessarily be imperfect without a reference to the history of the linseed as imported into this country. Russia is the great linseed-producing country of Europe; and, previous to the Crimean war, our supplies were almost entirely drawn from St. Petersburg, Archangel, and

other ports of the North; also from Odessa, Taganrog, and other ports on the coast of the Black Sea in the South. But during the Russian war, these ports were blockaded, and the difficulty then experienced in obtaining the required supplies led to considerable importations from India; and such an impetus was thus given to the growth of linseed, that the quantity now imported from the East is larger than that received from Russia, which has never fully recovered her trade.

Even before the war, linseed had always more or less of foreign seeds mixed with it, and was shipped in a very impure condition; but it was during the scarcity caused by the war that it became so very much adulterated, and the principal seat of that adulteration was Odessa.

At that time there existed in this country no institution for checking the growing evil; but this check was ultimately provided for by the formation of the "Linseed Association of London."

(Samples of linseed were shown as imported previous to, and during the war, to illustrate how loaded it was with impurities.)

There must necessarily be found mixed with every kind of linseed a certain amount of wild seeds gathered during the operation of harvesting. This is especially the case with "flax dodder," which is a parasitical plant; but as all, or nearly all, the accidental seeds are smaller than the linseed, proper screening should remove them.

Careless harvesting and positive adulteration had, however, reached such a pitch that, in 1864, importers and crushers founded an association called the "Linseed Association," and agreed in future to buy and sell on L. A. terms, which were that 4 per cent. only of admixture should be allowed, and that all beyond that proportion should be more or less a loss to the merchant. These terms were soon understood and conformed to by the shippers; and there is consequently, at the present time, no difficulty in procuring linseed almost pure; neither, on the other hand, is there any difficulty in procuring linseed with a large admixture of weed seeds, for at the present time Riga and St. Petersburg seed, and probably others, may be purchased without reference to L. A. terms; and, when it is understood that there are sometimes from twelve to fifteen or twenty different foreign seeds mixed with the linseed, and that the whole adulteration may amount to 30 per cent., it will be seen how wide a margin there is left for unscrupulous crushers of linseed.

(Samples were exhibited showing a great improvement in linseed imported after the L. A. was established.)

It will also be observed that there exists much difference in size between the Russian and the Sicilian or East Indian linseed. The linseed grown in a tropical climate does not produce so fine a quality of oil, but it yields a larger amount of farina, and makes a more nutritious cake; and of the different samples of East Indian linseed before you, that from Bombay has the preference. The small seed grown in a cold climate, however, yields the linseed oil most esteemed by painters and varnish makers for its excellent drying qualities.

It is in the East Indian linseed, the best for its farina, that the wild rape and wild mustard are found, usually not alone, but mixed with grass seeds; and it is to these pungent seeds of the natural order *Cruciferae* that our especial objections apply, the volatile oil being developed on the addition of the hot water necessary to form a poultice.

(There are here samples of flax dodder found chiefly with seed from the Russian ports; also wild rape, wild mustard from the East Indian linseed, and others, probably grass seeds.)

It would be well for those who reside in agricultural districts, and may be called upon to examine linseed cake, to make themselves especially acquainted with the microscopical characters of linseed; and for that purpose I cannot do better than refer them to some interesting remarks on the subject in the *Pharmaceutical Journal*, Feb. 18, 1871, p. 663, by our president, Mr. Stoddart.

I will just mention here a case where the agricultural mind has been imposed upon. Wild charlock or corn-mustard seed, of little or no value, is mixed with turnip seed (which it much resembles), and is then sold as genuine turnip seed; but, previous to its being mixed, it is subjected to a temperature sufficient to destroy its germinating property. When the mixed seed is sown, the turnip consequently only comes up, and the fraud is not discovered, for "dead men tell no tales." Charlock is usually met with in English linseed, which is not used by crushers.

The ordinary linseed-meal of commerce, as I have previously remarked, is usually made by grinding and sifting a very dry linseed-cake; this is generally an imported cake, as English-made cake always contains water, whilst the foreign cake must have been thoroughly dried to have stood the voyage without becoming mouldy or heated. Fresh English linseed-cake ordinarily contains 10 per cent. of water, and such a cake, if ground into meal, would not keep well. The foreign cake is chiefly imported from New York and Marseilles.

In the United States linseed is pressed for its oil as it is here; the consumption of linseed-oil in that country being greater than the home supply, it is supplemented by purchases of oil made in England; but the cake is not used for fattening cattle to the same extent as it is here, consequently they are able to export cake for the English market; they are thus buyers of oil and sellers of cake.

This imported and impure cake is the material from which the ordinary linseed meal of the shops is prepared; and though largely and extensively used, does not fulfil the requirements of British Pharmacy. Its price, one-half that of the pure farina of crushed linseed, is a sufficient indication of its character and quality. Sometimes the farina of crushed linseed is mixed with this cheap meal so as to reduce the price, and the mixture is thus sold with a semblance of purity.

The conclusion at which I have arrived is, that most of the linseed-meal of commerce does not come up to the required standard of the Pharmacopœia. On the other hand, a great deal of that which is commercially pure is not elegant, containing either too much oil or too large a quantity of husk, sometimes both, and that which is the produce of foreign cake can never be relied on, inasmuch as it contains irritating matter, which has in many instances on record resulted in considerable mischief.

To produce a good "lini farina," the linseed (preference having been given to that from Bombay or Sicily) should, I am informed, after passing the rolls, have a portion of its oil expressed without heat, then be ground, and afterwards have the husk sifted out; the resulting farina, when mixed with hot water, will then assume a gelatinous consistence, and be quite free from volatile pungency such as that of mustard, and, if kept in a cask lined with tin, it will remain good for several months. This, in my opinion, is the "lini farina" best adapted for a linseed-meal poultice, a therapeutic agent seldom properly made, generally despised, but for which there has not yet been introduced an efficient substitute; and I trust that some crusher who may have his attention drawn to the contents of this paper will make it his business to prepare a "lini farina" for pharmacists in conformity with these suggestions.

In conclusion, I would submit for your examination, samples of true lini farina, pure English cake, good American cake, inferior American cake, from which the meal is ground, and the linseed-meal of the shops.

The CHAIRMAN said that his early experience respecting linseed rather astonished him. When he first went to the West of England

in Worcester, the rate was threepence per pound for Linseed and sixpence for Linseed-meal: but when he got to Bristol the rate was sixpence for Linseed and threepence for Linseed-meal. The quantity used in Bristol was enormous. With regard to adulteration, Linseed was certainly very much adulterated. He had no hesitation in saying from his experience of analytical work, that it was adulterated to the extent of at least fifteen per cent.

Mr. BELL said he thought that there was more Linseed imported into Hull than into any other town in England, and perhaps more adulteration was practised there. Linseed cake was frequently adulterated with "buffum." He had great objection to using linseed meal on account of that. With regard to crushed linseed, his experience told him that it was the best. He bought it in small quantities, and it kept its properties to the last.

Mr. DEASE said that for a long portion of the time he had been in business he had been in the habit of using the ordinary ground cake, believing it to be the thing that was intended to be used, but a few years ago a curious circumstance occurred. He gave to a person, for a domestic purpose, some linseed-meal, and in the course of some days he was told that where any portion of the poultice had fallen on the patient it produced a blister. On making inquiry into the subject, and a careful examination by the microscope, he found that the mischief arose, as he believed, through the mixture of Cruciferous seeds which the linseed contained. Probably these were not seeds put in intentionally, but arose from careless culture and careless dressing. They formed part of the crop, and had been sent out without regard to consequences, because they added to the bulk. He had been in the habit for many years of using crushed linseed, taking care to have it in such quantities that it would not spoil by keeping. It was a curious circumstance with regard to the seeds grown in some parts of Europe, that they made the finest oil for painters, provided they were not contaminated by those wild seeds. From all he knew about linseed, he thought it should make all chemists very careful as to what kind of linseed they made use of. He was quite satisfied that if the linseed-cake was genuine—ground cake, free from contamination—it made an excellent poultice and kept better than the other. But as there was difficulty in getting that, it was better to get the crushed linseed from a respectable house rather than run the risk of getting meal from cake the history of which they knew nothing about.

Mr. ATKINS said that he could testify to the large amount of meal consumed in the West of England. The ordinary linseed-meal or

crushed cake cost about 14s. per cwt., and the crushed linseed about 32s. The retail price at Salisbury was 4d. for linseed-meal and 6d. for linseed, whole and crushed.

MR. COLLINS said, with regard to the linseed they had from India, that there was great carelessness shown in the docks. They would find rice-seeds and all other kinds of seeds amongst it; and very often when the men were turning the sacks the seeds fell down and were freely mixed. Sometimes the bags were made so loose in texture, that various kinds of seeds fell through and mixed with the linseed.

MR. BOTTLE said he had found difficulty in getting the proper linseed meal. He had discarded it and purchased crushed linseed.

MR. MACKAY said that the pharmacist had no reason to go away to the West of England in order to get a really good linseed-meal. Some years ago he was a good deal bothered about this article. It was not unlike the American meal, and the dreadful thing was it had this peculiarity, that it was so hard that the ordinary means of making it into a poultice were unsuccessful, and the hardness of the particles caused a great deal of trouble, annoyance, irritation, and even pain. He tried many places; he even went to England, and the experiences he had were exceedingly unsatisfactory, until he fell on crushers of seed not far from Edinburgh—Wacklin, Ruddock & Co.—and from experience he could say that their linseed-meal was very good, and 5 per cent. cheaper than in some other places. If pharmacists applied to that firm for a sample of their linseed-meal he had no doubt that they would be satisfied.

MR. HANBURY said that during his business experience in London, the firm with which he was connected used to keep the crushed linseed and the powdered cake, but the latter was scarcely ever required.

MR. FRAZER said that in Glasgow, considerably above twenty years ago, the crushed seed was first brought under his notice by a Liverpool house. He found it to be a genuine article, and at once introduced it. He had since then ceased to keep the article made from the cake; and, notwithstanding its higher price, had found the public gave the crushed seed a most decided preference.

MR. GREENISH considered that the objection urged against "crushed linseed," that it oxidized very rapidly, was met by the sample on the table, from which a portion of the oil had been expressed, and in that condition, if properly kept, it would remain good for a reasonable length of time. As to Mr. Collins's remark with reference to admixture at the docks, all he could say was that it had not come under his notice.

Mr. COLLINS stated that in the docks he had seen it to a considerable extent.

A MEMBER said that he thought they would like to know the results of the crushing of the seeds, with reference to the amount of oil that was given off by the different seeds which came from the various countries. There was an old article of domestic use called carron oil. Could any member inform him whether linseed-oil had been used for the manufacture of that? It would evidently affect the carron oil if it contained many of these seeds. It was still much in use, and more preferred in domestic use than the finer article, olive oil.

Mr. GREENISH, in reply, said the average quantity of oil in linseed was from 25 to 30 per cent., and probably 10 per cent. of that would be pressed out in making the farina. With reference to the quantity of oil from different seeds, those from Bombay and Calcutta yielded a much larger quantity than the Russian seed, but any reference to this point would involve a larger subject and have no practical bearing on the present question.

Dr. ATTFIELD read a paper on

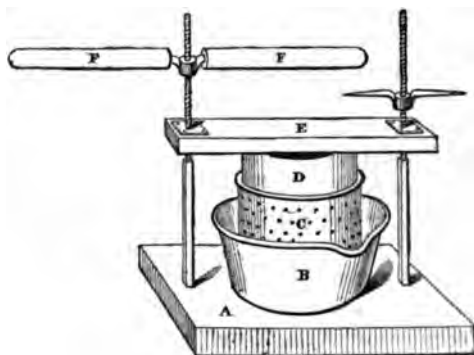
THE TINCTURE PRESS.

By C. A. STAPLES.

The tincture press is one of the most important implements in the pharmaceutical laboratory. Without its judicious use, not only would the loss of tincture in quantity be very great, but in quality also; the latter portion of fluid obtained by the press being the richest in extractive matter. Indeed, the preparation does not fairly represent the Pharmacopœia article until it has been thoroughly expressed, and the products mixed together. Such being the value and importance of the tincture press, I have often felt surprised that so little improvement has been made in it. The workmanship has certainly been brought to a degree of perfection that cannot fail to command our highest admiration, but the faults remain. The first defect that strikes the intelligent mechanic is the severe torsion of the screw. The implement is usually constructed with a powerful cast-iron frame, in which the female screw is fixed, the male screw being turned by a lever. The effect of this method of applying the power is a tendency to force the screw out of the perpendicular. But it would bear a much greater power without injury if such power were applied to the female screw or nut. To make myself better understood, imagine a wire hanging from a beam,

and it, and notice the enormous weight it will bear without injury. Now reverse the position, and try to support the weight at the top, will require a much stronger wire to act as a pillar, or it will bend and the weight come to the ground. Now this may be compared to the screw of the press: the power applied being usually expressed equivalent to so many pounds weight; this is sometimes enormous, and will be understood by the following simple calculation. In a small screw-press, such as is usually found in the pharmaceutical laboratory, the lever radiates from the centre, say 12 inches, it would travel a circumference of over 72 inches for each revolution of the screw. Now place the rule to the screw, and note the number of threads to the inch; if 6, this would give $72 \times 6 = 432$, as the number of inches the lever travels for each inch of pressure obtained; that is to say, the power is multiplied 432 times. Now if we imagine a force equal to 100 lbs. applied to the end of the lever (and this is but a moderate estimate of a man's strength), it would give $432 \times 100 = 43,200$ lbs. as the weight such pressure would represent; so we may compare the screw of the press to a column supporting a weight of nearly *twenty tons*! How is it to support this prodigious weight? Evidently only by increasing its bulk, and consequently the friction, cumbersomeness, and expense of the implement. It may be objected that these figures are somewhat theoretical. I take them as an example of the laws by which the force of mechanical powers is usually computed, but I am sure it will be readily conceded that if well applied, the power of a good screw-press is very great, and that if cases do arise where it fails to meet the requirements of the pharmaceutical laboratory, they must be extremely rare. The next defect to be noticed in the iron frame press is its rigidity; the pressure ceases the instant the hand is taken from the lever; now to bring the expression of a large mass of tincture to a successful and economical termination will occupy several hours, during the whole of which time it should be subjected to a steady, firm, but elastic pressure. At first it must be very gentle, or the substance will be forced through the holes or the cylinder burst open, but as the process advances, more pressure should be applied, and gradually increased until the full power of the press is brought to use. Now it is evident that this uniform pressure cannot be maintained by an implement, the excellence of which consists in the firmness of its parts, without the uninterrupted labour of some man with his hand on the lever to keep the pressure constantly applied, requiring an amount of time and labour that would add greatly to the cost of the production, and that might be saved by an im-

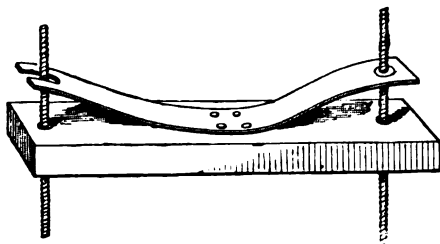
provement in the machinery. The next defect we observe is, that an additional vessel (generally an evaporating basin) has to be used to receive the expressed juice as it flows from the spout at the bottom of the cylinder; this may appear a trifle, of which it is frivolous to complain, but where the press is portable, it sometimes causes considerable annoyance and loss. The assistant endeavours to steady the press with his foot, from which it frequently slips, and the basin may be overturned or broken, and the product wasted. Taking all these defects into consideration, and thinking that my slight mechanical knowledge might enable me to design a press in which some of them would be remedied, I drew a rough sketch of my idea, and had the parts manufactured in a simple inexpensive manner, so as to produce a working model, from which I purposed constructing a more perfect and highly finished implement when I had discovered and corrected the faults which only experience could detect. I have endeavoured to represent it as it appears, but I am not a draughtsman, which I trust will be my apology for the rudeness of the sketch.



A is a strong platform of oak plank, into which two square iron bolts secured by broad flat heads are firmly fixed, rising perpendicularly to it, and parallel to each other, and having a screw-thread cut in them about half their length. B is a spouted basin of tinned plate to receive the expressed juice. C is the cylinder of tinned iron plate pierced with fine holes. The block D, of turned wood covered with tinned plate, is forced into the cylinder by the wooden cross-beam E, which has a hole at each end, through which the screws pass, large enough to allow it to slide freely up and down the screws, and armed with a piece of polished iron plate to diminish the friction.

The power is applied to the nuts or female screws, polished at the bottom and furnished with wooden handles F F : these are purposely omitted at the right to show the form of the nuts as forged by the smith. The cylinder holds half a gallon. I have also one holding about a pint. Several of them of various sizes might be used by the same press.

This simple inexpensive implement possesses many advantages : it is light and portable, works easily, has very great power, and as the power is applied in the best manner, the strain is very slight, and the friction less than would be expected. I have had it in use about fifteen years, it has never got out of order, or required any repairs (excepting an accident from undue violence). Of course it would be better if the workmanship were more highly finished (*e.g.* with steel screws substituted for iron), but as my old model is still in such good working order, I have not yet replaced it by the more perfect implement, or discovered the faults that I expected I should have to correct. The only improvement I can suggest is the increase of its elasticity ; and this I would propose to accomplish by a powerful steel spring screwed to the centre of the cross-bar, and rising a little from it at each end, somewhat in the form shown in the sketch.



The handles would be just above the spring. Without experience I am not prepared to give the exact size and substance of the spring, but I think it should be about 2 inches broad, $\frac{1}{4}$ inch thick in the centre, decreasing to about $\frac{1}{8}$ at the ends. The holes through which the screws pass would be elongated or a slit filed at the end of the spring, care being taken to give sufficient space for it to rise and fall without injury to the screws. In my opinion the spring would effect a great saving of labour. The first effect of the power would be to depress the substance in the cylinder ; this offering resistance, further power would force the spring down to the cross beam. The press being now set aside, the spring would continue to act upon it. The action would thus be somewhat automatic. For a very large press,

probably a compound spring (on the principle of the coach-spring) would be required.

Mr. GREENISH, Mr. SAVAGE, Mr. NEWBIGGIN and others made a few remarks on the construction of the press, and a general approval was given of it.

Wednesday Afternoon, August 1.

Mr. D. HANBURY read a paper on—

WILD RUE OR HARMAL SEEDS (*Semen Harmalæ*).

By Dr. F. A. FLÜCKIGER,

*Professor of Pharmacy and Pharmacognosy in the University
of Bern.*

One of the plants named in the Non-official List of the *Pharmacopœia of India* is *Peganum Harmala* Linn., the seeds of which have long held a place in Eastern medicine, and are an article of the *Materia Medica* respecting which Dr. Waring, the author of the *pharmacopœia* in question, remarks that further investigation is desirable.

Although the following notes do not tend much to elucidate the therapeutical properties of this drug, regarding which information is most wanted, they may not be without some value as a contribution to its pharmacological history.

For convenience of reference, I have arranged my remarks under distinct heads.

Botanical Origin.—*Peganum Harmala* Linn., belongs to the Order *Rutaceæ*. It is a strong-smelling, herbaceous plant from 1 to 3 feet high, found wild in Southern Europe, Asia Minor, Egypt, Arabia, North Western India, and Southern Siberia.

History.—The plant is the *Πήγανον ἄγριον* (wild rue) of Dioscorides, *Πήγανον* being the name still applied in Greece to several species of *Ruta*. The seeds were used medicinally by the ancient Greeks as they are to this day in India, where they are chiefly known by the old Arabic name of *Harmal*. In Europe they were formerly much employed as *Semen Rutæ silvestris*, and as such are enumerated among the simples of several of the early London *Pharmacopœias*.

Description.—The seeds are of a dark brown, $1\frac{1}{4}$ lines in length and $\frac{1}{2}$ to 1 line in diameter, variable in form, but usually conical or with a semi-lunar or crescent-shaped outline, always angular, and

gucose on the surface. They have an aromatic taste resembling rue, with some bitterness.

Microscopic Structure.—The testa is built up of two distinct layers, the outer forming a spongy tissue which consists of large, thick-walled cells. The cells of the inner layer are of a somewhat cubic form showing a peculiar undulated outline. The albumen exhibits the usual thick-walled cells, the embryo consisting of a more delicate tissue. These cells contain chiefly albuminous matters, fat, and essential oil.

Chemical Composition.—The most interesting fact concerning these seeds which immediately claims attention, is the magnificent green fluorescence which they impart to alcohol of about 75 per cent.* This optical power is partly due to a substance called *harmin*, and partly, it would appear, to the formation of a peculiar colouring matter named *harmala-red*, which has not yet been fully examined, but which does not pre-exist in the fresh seed.

Fritzsche has shown that the seeds yield 2 to 3 per cent. of an alkaloid termed *harmalin*, which is contained in the outer coat or testa. It is obtainable in colourless crystals, sparingly soluble in water or in ether, but more readily in alcohol, the solutions being of a bitter taste. Its composition is indicated by the formula $\frac{1}{2} \text{H}_{14} \text{N O} \cdot \dagger$

By heating the bichromate of harmalin, another alkaloid, *harmin* ($\text{C}_{13} \text{H}_{13} \text{N}_2 \text{O}$), is produced, of which about $1\frac{1}{3}$ per cent. may also be obtained directly from the seeds. Harmin forms colourless crystals and colourless or slightly yellow salts. The alcoholic solutions of these compounds exhibit, when dilute, a blue fluorescence.

Further details respecting these alkaloids, condensed from Fritzsche's original papers, may be found in Gmelin's *Handbook of Chemistry*, \ddagger as well as in Husemann's *Pflanzenstoffe*.§

Uses.—In the East, stimulant, anthelmintic, and even narcotic virtues have long been attributed to harmal seeds, but accurate observations respecting their medicinal powers are still required.

In Southern Russia a red dye, asserted to be both brilliant and permanent, is extracted from them. Finally, they have been grown as an oil-seed.

* It may be observed even with a single seed.

† C=12, O=16.

‡ Vol. xvi. (1864) 103.

§ Berlin, 1870, page 56.

Dr. ATTFIELD read a paper on

A METHOD OF OBTAINING DISTILLED WATER ECONOMICALLY.

By C. A. STAPLES.

Very few words need be said about the value and importance of distilled water. I do not write a treatise to prove a fact patent to every chemist, but knowing the great inconvenience many experience where they are not in a position to obtain a supply of it promptly, I wish to point out to them an easy and inexpensive arrangement by which an abundance is brought within the reach of every householder, viz., by the very simple expedient of converting the kitchen boiler into a still.

I first tried the experiment about twelve years ago in the simplest manner, not knowing what difficulties or even danger I might experience from its use, but I have found none. A few improvements have since been added, and I now propose describing the whole plan for the benefit of all who may adopt it.

The boiler is a small cast-iron one, such as is usually supplied with the kitchen range for a small private family; it is self-filling by a small cistern and ball-cock in the usual manner. This cistern having cold water constantly flowing through it, I thought that it would act as a condenser, and it will be so called in the following description.

The lid of the boiler is closed by a paste of castor oil and whiting, which does not harden. The top plate has a hole drilled in it at the back corner near the wall, into which a piece of stout brass tube,* about nine or ten inches long, is fixed. To the top of this a piece of half-inch tube of *pure tin*† is fitted, bent to an angle of about 60° or 65°, which, passing through a hole in the brick-work at a regular fall of about 25° or 30°, projects a few inches beyond the other side of the wall, where the end, slightly contracted by a file and curving downwards, is received into the enlarged mouth of a similar piece of tube, into which it fits with sufficient firmness without any joint or cement. It then enters the condenser near the top, is curved half round the inside out of the way of the ball, and passes out at the centre of the bottom, being secured to the condenser by

* Any piece of tube will do. Mine is a piece of a gas pillar, such as is screwed into a counter.

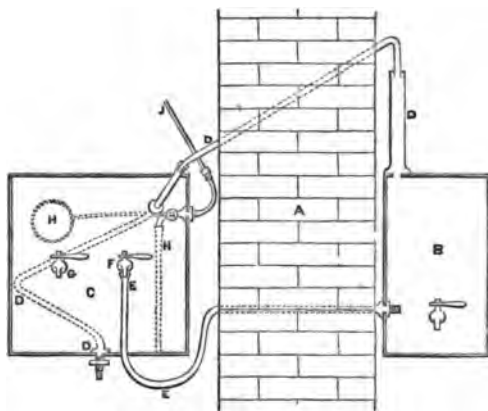
† For a very large boiler a $\frac{3}{4}$ or even 1-inch pipe might be required, and the boiler should be made of wrought iron.

screw joints ; that at the top may be an ordinary brass one, but the lower one should be cast in pure tin, or if a brass one is used, it must be carefully tinned inside and out, for although not in immediate contact with the distilled water, a slight moisture might collect on it and injure the water.

The lower end of the pipe should be tied over with muslin ; or closed and pierced with fine holes, since insects, attracted by the warmth and moisture, might enter it in the night. In fact, the greatest care must be taken to ensure the purity of the metal, and that the inside of the pipe, from the point of condensation, is protected from any metallic or other contamination. The condenser should be much larger than usual, and have a lid fitting *inside*, or steam will collect on it and flow down the outside of the condenser. It should stand on a stool with a hole for the pipe to pass through, under which the jar to receive the distilled water could be placed out of the way. The ball-cock should have a piece of pipe soldered to the nozzle, that the cold water may reach the bottom of the condenser. The pipe for feeding the boiler should come from about the centre of the condenser and curve downwards, so that a portion may be below the bottom of the boiler ; for without this precaution the heated water would circulate to and from the condenser, and the water would soon become nearly as hot as that in the boiler itself. This simple precaution effectually prevents it, as the heated water will not pass through the cold part of the pipe below it without pressure. It should also be furnished with a stop-cock ; all the joints should be secured by a few disks of stout brown paper over the flange, which, when drawn tight by the nut, effectually prevent leakage, and are easily removed if required for alteration, repair, or cleansing. But if they are fixed with lead cement, they become so firm that they cannot be removed without injury. The condenser should have a waste pipe, unless the main cistern has a stop-cock to shut off the whole supply at night, or the condenser may overflow, since the ball-cock must necessarily work easily, and a slight leakage might be expected. The hole in the brickwork should have a piece of iron pipe cemented into it, to form a regular slope for the steam pipe, otherwise it might drop into the hollow space and water collect in it.

I found the experiment very successful, the supply of distilled water being abundant and pure enough for any purpose. It is perfectly self-acting, the boiler fills itself and the water distils itself. It does not cause any inconvenience, interfere with any domestic or culinary operation, or limit the use of the boiler ; on the contrary, it is greatly increased, as an abundant supply of heated water may

be drawn from the condenser, care being taken to close the stop-cock and keep it closed for ten or fifteen minutes, or until the heated water is replaced by cold. It is perfectly safe, as the steam escapes freely through the tube, and the lid of the boiler, although steam-tight, may be raised with the thumb and finger. Little attention is required beyond placing a vessel to receive the distilled water, and seeing that it does not overflow; the supply being so copious that sometimes, while cooking a dinner for a moderate family, several gallons will come over. I have found it difficult to give a perspective view of the apparatus, as some part must be concealed by the projecting brickwork, but hope it may be sufficiently understood by this partly sectional sketch.



A, brickwork of chimney jamb. B, boiler. C, condenser. D D D D, course of steam-pipe. E, curved tube for feeding the boiler. F, stop-cock screwed to condenser. G, cock for drawing heated water from condenser. H H, ball-cock, with tube for cold water to reach the bottom of condenser. J, pipe communicating with main cistern. This pipe need not be large, as the water will never flow much larger than a gooseneck. Mine is only $\frac{1}{4}$ -inch, but for a very large boiler I should think one $\frac{3}{8}$ ths of an inch would be ample.

Mr. SAVAGE pointed out what he considered to be one or two objections to the method.

Mr. BAILDON said that fifteen years ago he had occasion to fit up a small range. This range at one side had a high-pressure boiler, and he got inserted a valve that could be shut or left open. When

open, the steam passed out through an ordinary condenser, and from that day to this he had not had difficulty in getting distilled water.

Mr. BOTTLE said that this was a similar arrangement to that which he had used twenty-five years ago.

Mr. WILLIAMS stated that one thing in connection with this subject was, that the Excise insisted on their paying still-licence for the right to distil water.

Mr. BAILDON remarked that it was ascertained some time ago that that was not the case.

Mr. WILLIAMS said that he thought Mr. Baildon must have been misinformed.

Mr. BAILDON stated that he had himself discontinued taking out a licence for many years in consequence of what the Excise had stated.

A MEMBER asked whether it was because Mr. Baildon had a steam engine, so that he could get distilled water from it, that he escaped the excise? If he had a still, he certainly would have to pay for it.

Mr. BAILDON said that he had not a still.

Dr. ATTFIELD: Then the Excise allow you to distil because you have not a *still* on the premises?

A MEMBER: Mr. Baildon has a steam-engine.

Dr. ATTFIELD: Then the position is this—you may distil if your still is an engine-boiler.

Mr. MACKAY said he thought that if the plan proposed by Mr. Baildon were adopted, and if it became known to the Excise, the chemists would have to pay 10s. 6d.

Dr. PAUL stated that he had been in communication with the Excise authorities on the subject, and, in answer to whether the chemists might use a still for distilling water, was told that, although the Inland Revenue had power to grant exemption from the provisions of the Act as to licences, there was such extreme difficulty in drawing the line between cases subject to payment of duty, and cases which might be exempted from it, that they were often at a loss what action to take, and found it practically necessary to insist on the payment of licences from every one who had a still, that was, a vessel capable of the distillation of alcohol. Although there was a willingness to remit the licence when it was objectionable, they found it impossible always to do so. Some years ago he was engaged in a manufacture where distillation was carried on. They had several stills, for all of which they had to pay licence, and it was a somewhat serious tax. He applied to the Income-tax Commissioners, and requested them to allow him to use the stills without

a licence. In that case they did give permission, but the material distilled was tar. He had some difficulty in making them understand that it could not be used for the distillation of alcohol, but so soon as they were satisfied of that they granted his request; and he believed that they would do the same in other cases if they were satisfied that it was for such purpose.

PHARMACEUTICAL ETHICS.—*RE* "APPRENTICESHIP."

By S. R. ATKINS.

We venture to claim for the subject now introduced to your notice the merit, at least, of practical importance.

It is evident, on a moment's reflection, that the future of pharmacy is vested in the hands of our young men.

We are all alike interested,—the trainer, the trained, and the public on whom we depend. The present generation of principals were in their day pupils, whilst the pupils of to-day will in their turn be teachers. But apart from the abstract or general merits of the question, there are special and particular aspects of it at the present moment which deserve our careful consideration.

Let us inquire what *Apprenticeship* means. It is an arrangement through which a youth is placed by his parents or guardians under the care of a third person to learn a profession or trade, the remuneration for which education is called "the premium."

It is relevant here to inquire if this system be a good one and desirable to be continued, for we scarcely need remind the readers of "The Year Book," and of the interesting article it contains on American pharmacy, that the *institution* of apprenticeship, as our transatlantic cousins would term it, does not exist amongst themselves. We are disposed to answer this question affirmatively, but, at the same time, endeavour to show what modifications are needed.

We venture on this subject with some degree of diffidence, remembering how ably and comprehensively the entire field of pharmaceutical ethics has been surveyed by Mr. Ince, a name, by the bye, worthy of the highest respect of all pharmacists; we refer more particularly to the elaborate paper read at the Nottingham meeting.

It is with great satisfaction we also recognise the ably expressed opinions on this and kindred branches of the same subject, of Messrs. Giles, Schacht, Brady, Bengler, and others.

On the other hand, the question is by no means as yet threshed

out; indeed, it is doubtful if it has yet been fairly grappled with, whilst the difficulties inherent must, from the nature of things, increase for a time at least. A statement of the facts in the first place, and of suggestions remedial in the second place, will probably be the best plan on the present occasion.

1st. For the facts.

Fewer apprentices are being taken. Of these it is to be feared comparatively a small proportion are being trained in establishments competent for the task. The results are evident in the Preliminary Examination. Those who, like myself, are familiar with the facts of provincial education, know that the failure of our youth in that initial test scatters dismay amongst their own ranks and that of their friends. The standard of that examination it would not be wise to lower; if that be done, the subsequent or higher rungs of the ladder must be reduced in proportion. To say the least, such a course would be an anachronism in an age of growing culture in the nation generally, and when from ourselves special demands are made, as the result of that chartered status, so long nobly fought for, and at length secured. Our classic houses both in town and country have not yet felt the pressure, but there can be no doubt that sooner or later they will have to acknowledge the inexorable logic of facts. The supply of young men is not keeping pace with the demand. Many personal friends of mine are declining the responsibility of taking apprentices. Men competent for the work say, "We have done our share in this matter, and will now leave it to others." The result is, our youths are being relegated to third-rate houses, in which "the premium" is the "consideration" in more senses than one, where the habit of industry may be acquired, and the charms of variety are freely offered, but where chemistry and pharmacy are conspicuous only by their absence.

Such, in brief, are the facts of the case. And now what remedial measures can be suggested? for we all know how much easier it is to criticize than construct, to analyze than to synthesize.

We start then from the position that the ordinance of apprenticeship is in itself sound and good. What can be done to bring it into more harmonious working with the other gear of pharmaceutical machinery? Confessedly the difficulty lies in the transition period of the next few years. That the thing will come right in the end there can be no doubt.

Firstly, we insist on the Preliminary Examination, or its equivalent, one of the University Local Examinations, being passed as a prerequisite of apprenticeship.

The advantages thus secured would be immense, and felt at each subsequent stage. An eligible start would have been secured for the youth, whilst the master is placed in a less invidious position. A lad submitting to the test immediately on leaving school should be in "form" to win the race; whilst for ourselves, as men of business, we are conscious of the fact, whatever our capabilities may have been when school-days ended, and we had our first introduction to the pestle and mortar, that at any rate *now* we cannot accept the responsibility of teaching Ovid or Euclid.

We urge then a liberal and prolonged school-training, to be continued at least until sixteen years of age; this will necessitate the ranks of pharmacists being recruited from the substantial section of the middle class; *pari passu*, this will be a gain, for whilst we gladly acknowledge the fact that intellectual force as well as moral quality is not confined to any rank of society, there clearly would be less disappointment if those who joined our order were more equally weighted at starting, not only in educational advantages, but in pecuniary prospects; we might then hope to see a diminution of those wretchedly small businesses, the cause of much more heart-breaking than is indicated in the *Gazette*, or in the list of our Benevolent Society.

The next point to which we advert is the *shortening the term of apprenticeship*. Three years, or at most four, will be regarded as sufficient. The contraction of the time must prove a mutual benefit; less to be played with, concentration of energies will be aimed at and achieved.

An improved treatment of our apprentices will inevitably arise as the result of mutual confidence and respect. At its best estate, and under the most favourable circumstances, the pursuit of pharmacy has many drawbacks, but what it must be when these conditions are wanting, it is sad to think—long hours, short holidays, much work, and sometimes dirty too; this is, alas! too often the plain prose which destroys all the early romance of coloured carboys and mirrored glass.

Let us not be misconstrued; we have no contention with work and plenty of it too. The best men in any calling are those who have attacked its initial drudgery with brave hearts and strong arms, having faith in the law that no lasting or proportioned structure can be reared on an imperfect foundation. Only let us as principals see to it that the conditions under which that work is done are not too exacting.

We advance to the last consideration and the most important

What are the just claims our apprentices have on us for instruction, and to what extent are those claims at present being met?

By the deed of indenture we undertake not only to provide sufficient and suitable board and lodging, but we also covenant to teach the art and mystery of pharmacy. Let us fairly look this matter in the face; where do our responsibilities begin, and where do they end? We assume the Preliminary Examination, or its equivalent, has been passed; this, as we have already argued, must be insisted on as a *sine quâ non*.

A youth of sixteen enters an establishment with this credential in his hand, that he has received a liberal and classical education. Here then we start, and the goal at the end of the course is the Minor Examination of the Pharmaceutical Society. To enable a young man to acquit himself satisfactorily at that ordeal should be our aim; and in making this statement, we take it for granted the other qualifications which go to make a first-class business man are not overlooked, namely, method, order, punctuality, address, etc.

In the closing remarks of this paper we desire to avoid everything savouring of uncharitableness towards a body of men deserving the highest respect; we refer to the great body of our provincial brethren. These men are for the most part conducting their businesses with credit and success; but, not having possessed in their early days the advantages now so readily procurable, they are willing to confess their inability to impart the requisite knowledge with which to approach the "Minor."

What is the remedy for this state of affairs?

Bloomsbury Square is not available in the provinces; local schools are few and far between; in fact, they are well-nigh out of our calculation; invaluable as centres of light where their influence is felt, they but make the darkness beyond more visible. That something at once must and ought to be done, the large proportion of rejected candidates at our examinations painfully attests.

We have attempted the diagnosis of the disease, and ask the remedy; as a humble contribution to the same, we suggest that wherever there are some half-dozen young men in a town needing and seeking instruction in pharmacy, that is, the general course of reading suggested by the Minor Examination, they club together, during the winter months, engage a room, and respectfully solicit the direction of the most able pharmacist in the place to guide their studies. Further, that the Council of the Pharmaceutical Society foster provincial education with their recognition and active sympathy; that competent men in country towns be urged to

undertake this work, that class books be suggested, small cases of apparatus for the study of analysis be granted on loan, and the results of such labours find their recognition in the pages of the *Pharmaceutical Journal*.

Salisbury, July 5, 1871.

The CHAIRMAN said this was a subject on which the whole afternoon would hardly be long enough to hear those most capable of giving an opinion. Instead of entering into the subject himself, he would rather hear the opinion of others, such as his friend Mr. Deane. With regard to the question of education, he might remark that the questions now put to their apprentices by the Board of Examiners were so easy that he would be surprised if a lad could not answer them. It had been stated as an objection, that if they gave youths so much time for learning as some desired, they would not do enough of work. If they gave them a proper amount of study with their proper amount of business, he thought they ought to see that they did their work. He himself was apprenticed in a locality in which he was made to do drudgery, but which, he was thankful to say, he was obliged to learn. In his time of day they had no holidays. He began at half-past six o'clock in the morning, and left off at eleven at night. These were the hours, and he had no holidays, Sunday or Saturday. When he went to Bath he was astonished when his master offered him a fortnight's holidays. His own young men had an hour in the morning to themselves, and he had a good deal more work done than if he did not let them out. He recollected when he was ordered to do a great many things which youths nowadays would consider beneath them, and would not do. The force of example went a good deal further than anything he could tell them. One of his young men had seen him night after night at the microscope, and this young man might at first have thought that he was a very stupid fellow; but by-and-by he came to take an interest in the matter, and became as good a microscopist as there was in England. A good deal depended on the way in which they treated their young men. If they told them they must do such-and-such a thing, they would not enter into it with the same heart as if they had been persuaded to do it. He thought the paper was one of very great importance.

Mr. DEANE said his experience was much the same as that of Mr. Stoddart; but he considered that the altered condition of the times rendered the responsibility of taking apprentices much greater than it was thirty or forty years since.

Mr. SCHACHT said the subject immediately before the meeting was one he felt scarcely competent to speak about. It was this conviction that had hitherto kept him silent upon this one section of the subject he had so much at heart, pharmaceutical education. He candidly admitted he did not know how to meet it, it was beset with so many difficulties. In the first place a master, merely because he was a pharmacist, was expected to possess that great and special gift, the ability to guide and direct the moral training of a youth at the most critical period of his whole life. To add to his difficulty, it might be quite possible that two entirely opposite characters became his charges at the same time. It was also expected of him, not only that he should be a good pharmacist, but also that he should possess the qualities of a good schoolmaster, and that, contrary to general experience, he should be as well able to teach as to learn. These were some of the difficulties of the case, and the only solution that suggested itself consisted in the separation of some of these duties. If instead of it being the habit and rule that masters should receive youths into their houses as well as receive them into their businesses, an arrangement could be made whereby the youths' boarding and lodging could be done elsewhere, one great difficulty would be removed, and the master would be absolved from the charge of the moral training of his apprentices; and then it might be possible that some of the best houses who now, because of their disinclination to accept this charge, decline to take apprentices, would willingly offer their excellent professional opportunities. Again, as to the best method by which an apprentice could gain the scientific knowledge requisite to make him a good pharmacist, it seemed to him better that he should look for this outside his master's shop. It appeared almost too much to expect that the same man should be at once a good retail trader and an instructor in chemistry and botany. He did not mean that he could not help his pupil, but that he could scarcely be expected systematically to teach science; and all desultory work might as well be left alone. Would it not be better that during the time the apprentice was fulfilling his duties in the shop, certain portions of the day should be devoted to attending professional lectures, and some encouraging help given him in appropriating what he there heard? Speaking collectively, he thought the direction of their efforts should be to develop such a system of scientific education, away from the shop, as to make it unnecessary for the master to undertake that duty himself. The establishment of provincial centres with such classes as portions of their system was, he thought, the best means to this end; and he was glad to find the

observations of previous speakers tend so distinctly in that direction.

Mr. MACKAY (Edinburgh) said that Mr. Schacht had referred to what had occurred to the minds of the pharmacists in Scotland, as a very strange mode of procedure in binding apprentices throughout England. He wished to bring before the meeting the fact that in the whole of Scotland, as far as he was aware,—and he knew the arrangements of the pharmacists throughout the country very well,—he did not think there was a single case where a premium was paid and where a youth was boarded and taught his business. The very reverse was the case; and his object was to impress on the Conference, that the system which Scotland had adopted had not only been longer in existence, but had worked so admirably that he felt sure their friends in the South would be going in the right direction if they were to take a leaf from their book. Some years ago, before the Preliminary Examination was adopted, it was arranged that no youth should be taken by any chemist or druggist—at all events by no member of the Pharmaceutical Society—unless his parents or guardians agreed to pay fees for his attendance on certain classes the master, on the other hand, becoming bound to furnish him time for attending these classes. The system followed and still pursued was this: A fairly educated youth about to be apprenticed to a druggist was told, not that the period was to be three or four, but five years. The exceptional case of three or four years arose generally from a lad being pretty far advanced—say seventeen or eighteen years old,—in which case it was no uncommon thing to shorten the period. Five years might therefore be considered the usual term. Now, during these five years the lad was not kept by his master, but received a salary of £10 per annum. The lad thus apprenticed went to the business as a rule at 9 A.M., but if he had opened the shop at an earlier hour, he then got permission to go home to breakfast for a suitable time. Those who came with their breakfast got an hour and a half for dinner, and if this was early in the forenoon, then a few minutes were allowed in the afternoon for the apprentice to get refreshments. Such a plan had existed and worked in the most satisfactory manner for a very lengthened period. He might say, however, in regard to the Preliminary Examination, that he thought it now well understood by the leading pharmacists throughout Scotland that in the case of a young man applying to become an apprentice, in addition to the master giving time, it had become the rule that that young man must pass the Preliminary Examination. Nothing had been so satisfactory

s the determination that no young man should now be allowed to enter the Pharmaceutical Society unless he had passed that examination. He said this all the more strongly, because he had kept a register for situations for young men for many years, thus obliging employers who might want assistants. The young men were required to write a letter stating their capabilities and the kind of situation sought for, and he told them frankly that the letters they wrote would be shown to inquirers; they had therefore every opportunity to be careful in their style of writing, as well as in their grammar and orthography. The Conference would be astonished if they saw the letters now and again put into his hands by men who had served the regular apprenticeship of three, four, or five years to druggists. Such a state of things must end. By exacting the Society's examinations, they prevented the possibility of young men being allowed to apply for situations for which they were incapable. Many of them did not know the mere ordinary rudiments of the English language. It was a state of things which ought not to exist, considering the position which pharmacy now occupies. He concluded by strongly recommending the Scotch system to the consideration of their English brethren.

Dr. EDWARDS said he was not able to say that Canada represented the advanced guard, but it had assumed a very similar position to that of Scotland in this matter. The term of apprenticeship did not generally exceed four years, and the salary ranged from £10 the first year, £20 the second, £30 the third, and £40 the fourth. Four years, he believed, was the ordinary term, but very frequently three years were considered sufficient; and, as in Scotland, the apprentices did not reside in the house. The principal often resided in the country, or in another part of the city from the place where his shop or store was situated. He had experienced some of the difficulties which Mr. Schacht had suggested with regard to the social relationships of apprentices. The want would be better met by the apprentices residing in such families as were acquainted with their parents, or in such circumstances as parents might think proper to place them. He thought an agreement was better than the old system of indentures; and he was surprised when he read over some of the restrictions, such as not playing cards, not being allowed to smoke, nor to go out of the house without the master's permission. These were things that were curious, and belonged to old habits and customs. It was important for the Conference to keep in view that they had to provide men for the future. They could not over-estimate the importance of this, looking to the

demand there would be from foreign countries. One important point they should not lose sight of was a thorough knowledge of book-keeping; and in the matter of stock-taking, some chemists were very much at a loss indeed. These were matters to which it was important that attention should be directed.

Mr. ATKINS said he remembered reading a paper by Mr. Giles in the *Pharmaceutical Journal*, in which he advocated some system of boarding out. He (Mr. Atkins) could not say he had brought his mind entirely to agree with Mr. Giles's proposal. He could see the very great advantage, but also the disadvantage, of the proposed system. He feared the difficulty pointed out by Mr. Schacht would be enhanced were that plan carried out. That was in regard to the moral training. As to the provinces, Mr. Mackay's system would suit admirably for Glasgow and Edinburgh, and towns where classes could be obtained, but in other places it would not do.

The following papers were taken as read, owing to want of time:—

THE PREPARATION OF LIQUOR BISMUTHI.

By C. H. Wood, F.C.S.

For the last two years I have frequently resorted to a process for the preparation of a liquor bismuthi, which would, I think, constitute a good process for a future Pharmacopœia, because, while it is very simple and is easily performed, it yields a product quite free from nitrate of ammonia, and eliminates all the impurities of metallic bismuth.

To proceed by this method, I first obtain pure anhydrous oxide of bismuth. A weighed quantity of this oxide is then digested with a mixture of citrate of ammonia and citric acid in strong solution for 15 or 20 minutes at near the boiling temperature, after which a slight excess of ammonia is added, and the solution diluted to the required volume. The mixture of citrate of ammonia and citric acid rapidly and completely converts the anhydrous oxide into citrate of bismuth, which the ammonia afterwards added instantly dissolves.

The oxide of bismuth is best prepared from the subnitrate of commerce. A pound of the subnitrate is boiled for a few minutes with 4 pints of liq. potassæ, then washed by decantation, and dried in a stove or water-bath. It forms a dull lemon-yellow powder,

which is anhydrous and perfectly definite in composition, being represented by the formula Bi_2O_3 . 100 parts of the subnitrate yield from 81 to 82 of oxide.

Instead of boiling the basic nitrate with the potash, digestion in an earthenware jar, with frequent stirring, for an hour or two may be resorted to. Care should be taken to employ liq. potassæ free from carbonate. As the oxide subsides with great rapidity, it is perfectly washed with ease and quickness by decantation. I have always found commercial subnitrate of bismuth to be quite free from copper, and any traces of arsenic or antimony which it might contain would be completely removed by the potash; consequently the oxide of bismuth must necessarily be of great purity.

The following formula is adapted to the preparation of a gallon of liquor bismuthi, having the same strength as the solution of the Pharmacopœia:—

R	Oxide of Bismuth	9 oz.
	Citric Acid	16 oz.
	Strong Solution of Ammonia	12 fl. oz. or q. s.
	Water	q. s.

Dissolve 8 oz. of the citric acid in 4 oz. of hot water, and carefully neutralize it with some of the solution of ammonia (about 7 fl. oz.), mixed with half its volume of water. Then add the other 8 oz. of citric acid, and when it has dissolved introduce the oxide of bismuth. Heat the mixture to near its boiling-point for about 15 minutes, with frequent stirring, then add about a pint of water, and introduce sufficient ammonia to dissolve the insoluble portion, and render the liquid slightly alkaline. Augment the solution to the volume of one gallon, and filter through paper.

It will be found upon heating the mixture that the pale yellow colour of the oxide rapidly changes to a pure white, and at the same time the insoluble portion becomes more bulky. These signs indicate the conversion of the oxide into citrate of bismuth; the digestion is continued for a little time to ensure the perfect completion of this change. The ammonia, subsequently added, should effect a complete solution, leaving nothing insoluble but the dust, etc., inevitably present in the powder taken.

As the oxide of bismuth employed is quite as definite a substance as the metal itself, it follows that the resulting liquor will be as uniform in strength as if prepared according to the process of the Pharmacopœia.

THE PROPOSED CHANGES IN THE NOMENCLATURE
OF THE PHARMACOPŒIA.

BY C. R. C. TICHBORNE, F.C.S., M.R.I.A., ETC.

Professor Attfield has lately proposed that certain changes should be made in the nomenclature of the British Pharmacopœia; that the modern notation only should be used, and that the terms employed should coincide with that notation. Thus, in the present Pharmacopœia two notations are employed, but only one nomenclature, and the framers of that work gave preference to that notation which harmonized with the old system; this, however, is now nearly obsolete.

Professor Attfield's Manual of Chemistry, in which the proposed nomenclature is used, has made such rapid progress in public estimation, that it may be considered to have almost become the medical and pharmaceutical text-book of chemistry. Its reputation is not one iota in advance of its merits; and as the originator of such a work, Professor Attfield's words come with even more force than they otherwise would. The general tenor of his recommendation is to the effect that we should retain some part of what is known as the Lavoisierian mode of nomenclature, but substituting the metallic names throughout for the alkalies and alkaline earths. Thus we should say sulphate of sodium, sulphate of iron, carbonate of magnesium, etc., instead of sulphate of soda, sulphate of iron, or carbonate of magnesia. Also that we should discard the old atomic weights, and use the new atomic weights alone.

With all this, I, as one humble worker in the field of science, heartily agree. Fourteen years ago I advocated these new-fangled ideas as they were then termed, and have consistently used them in practice. So little were such views entertained at that time, that, with one exception, there was not another chemist in Dublin who even acknowledged the probable correctness of such a system. What a change has been wrought in these fourteen years! This was the system used by Aug. Hofmann when the writer was at the College of Chemistry; and it will, perhaps, be in the memory of some of the gentlemen present, that exactly a similar system is used in his (Dr. Hofmann's) Report on the Exhibition of 1862. In speaking of this matter in the introduction of that work, he says, "The symbolic notation employed in this report requires a few words of explanation here, and perhaps also of justification. It differs from the notation

still in use only by the doubling of the equivalents usually assigned to oxygen, carbon, sulphur, and a few other elements. Slight, however, as this change is, it suffices to alter materially the aspect of many formulæ; and to those who still adhere to the old notation, it may give a little trouble which the reporter would willingly have spared them. For this reason, indeed, he hesitated a good deal before deciding to employ the modified notation. To this decision, however, he was ultimately brought by the reflection that the modified notation is essentially necessary to represent, with the requisite clearness and precision, the vast and daily multiplying class of substitution changes, and that on this ground only, if on no other, the double equivalents must ere long come into universal use." The author then uses the terms carbonate of sodium, sulphate of ammonium, etc. Dr. Attfield wishes to substitute a similar system for the Pharmacopœia, such a system that whilst giving due prominence to all the most firmly established theories of modern chemistry, also does away with such inconsistencies as calling one salt the sulphate of the oxide, and another salt, exactly framed upon the same type, the sulphate of the metal. It enables us to view all these salts as constructed upon one given framework.

Outside this area the system does not go; and when from time to time extreme terms are introduced to convey special or extreme theories, they should not be considered in any system intended for general instruction, but should be strictly confined to the writers of original research. But at the same time, the fraction of any science necessary for the furtherance of any other art must harmonize with knowledge to which we have attained; thus far must we go, and no farther. It is for this reason that I agree so thoroughly with what Dr. Attfield has advocated. I might, perhaps, object to a few of the individual names which he has proposed; but really these things are so much a matter of taste, and his paper has been so well and ably discussed, that I do not consider this the time or place to enter into such small matters.

Dr. Attfield makes use of a paragraph which seems to lay down a principle, which principle would, however, hardly agree with the practice of his own paper. Great prominence has been given to this supposed principle by some of the reviewers. Thus, an excellently-conducted one, the *Chemist and Druggist*, says, "Clearly he has proved his point, and shown that chemistry and pharmacy, though branches of the same science, have distinctive characters, and that it will be for the mutual advantage of both to adopt a nomen-

clature of their own." Now, I must dissent from this reviewer's method of putting the matter. A nomenclature is only a system for the conveyance of facts. It is not to be supposed that we could have two nomenclatures harmonizing equally, if at all, with facts. As well might we some years since, when the avoirdupois ounce was substituted for the troy ounce, have said that, as the division of the pound gave 437.5 grains to the ounce (which was inconvenient), pharmacy should have an arithmetic of its own, and that 1 and 1 in mathematics made 2, but in pharmacy they should make 3. No. We must have the same chemistry for the philosopher, the same chemistry for the pharmacist, and the same chemistry for the medical man; in other words, as near the truth as the science of the day will take us, and nothing but the truth. It was for this reason that I saw with pleasure that Dr. Attfield hit hard at such terms as *acidum arseniosum*, which, from a chemical point of view, are radically wrong. We are informed that there is not likely to be a new edition of the Pharmacopœia for some time; but I am quite convinced that when it does come we shall have the new atomic weights, and a binary notation and nomenclature in conformity with the new system alone. Thus will Dr. Hofmann's prophecy be fulfilled as regards another important branch of practical chemistry.

One of the proposed changes is, that the names should convey more accurately the actual chemical composition as found by analyses. Thus, it is proposed that the term oxyacetate of copper should be used for verdigris. The few cases met with in the Pharmacopœia similar to the above one are, I think, better got over by using trivial names, just as we in the Pharmacopœia specify a certain well-known quality of carbonate of calcium as chalk, although we have at the same time the pure article as far as ordinary chemical processes will give it. In fact, it is hard to say how the excess of oxide of copper found in the verdigris can be considered any more or less of an impurity than the silica found in the chalk. I am of opinion that we are rather too much inclined to view chemical decompositions as much too sharp and definite, and then in some instances to be too particular. Because we see a voluminous precipitate tumble down on adding hydrochloric acid to nitrate of silver, we are naturally predisposed to consider it as a perfect precipitation of all trace of silver; but, although such may practically be the case as far as our method of detection goes, it is really a rearrangement of the balance of forces which has a limit; and it is most probable that even with this the most definite of reactions, the pre-

cipitation is incomplete, and that, if we had instruments or reactions delicate enough, we should perceive such to be the case. That is to say, in nature there is no such thing as very sharp and hard lines. Thus, when we get a basic carbonate of magnesium on mixing carbonate of sodium and sulphate of magnesium in equivalent proportions, it is merely that some of the carbonic anhydride is partitioned off by the new arrangement of the forces; that the point where this partitioning off lies depends upon many circumstances, but principally that of temperature, and we get a precipitate of carbonate of magnesium, containing variable quantities of oxide of magnesium as an accidental impurity. Under such circumstances, should we not be nearer the truth by retaining the name carbonate of magnesium in this and similar cases, and give the notation as a hydrated carbonate of magnesium, and merely state amongst its characteristics that it contains generally 10 per cent. of oxide of magnesium?

I think the great difficulty in the perfect acceptance of the new nomenclature and notation in Pharmacy is, that most of the medical licensing bodies do not make it compulsory that the candidates should answer in the new notation. As long as it is optional with the medical student, it will never be perfectly adopted, for Pharmacy must sail in company with the practice of medicine. Now we find that in the year 1870 there were in this kingdom 1160 medical students registered, being much in excess of the pharmacists. With the Pharmaceutical student the acceptance of the new system is easy; chemistry is his principal and most difficult study. With botany it constitutes all his science; he must have both a theoretical and practical knowledge of it, or he is no pharmacist. He therefore will not mind a little more trouble, for the new system is a degree and only a degree more difficult. But chemistry hitherto has formed but a moiety of the medical student's study, and the little he did learn he looked upon as a matter of secondary importance. In such a case, if the student is presented with two roads, he will very naturally take the short one.

Before concluding, I may as well state, that I consider the nomenclature of the compound preparations of the Pharmacopœia open to a little revision; this would, however, be too long a subject to go into here. Thus I take it, that all those preparations should be named according to their most active therapeutic ingredient, the substances used as vehicles being ignored. If more than one active ingredient is used, it should be called a "compound" preparation. This is hardly carried out by the name "*tinctura camphoræ com-*

posita," a preparation where there are 40 grains of opium to 30 of camphor; by the omission of composita from tinctura sennæ, or tinctura rhei, whilst such names as linimentum potassii iodidi cum sapone might be shortened by leaving out the latter part. I hope, however, we shall have as little change as possible; but when we do make any, let it be to keep pace with the progress of science. There is no danger of Macaulay's New Zealander appearing on London Bridge for some generations to come; therefore, there is a long period before it for Pharmacy to assert itself in this country. It is done by ever bearing in view "that banner with the strange device — 'Excelsior.'"

CONCLUDING BUSINESS.

THANKS TO AUTHORS OF PAPERS.

Dr. PROCTOR said: I have been asked to propose that the acknowledgments of the members present be offered to the authors of papers read at the meetings. It would be difficult to overrate the value of these papers. Many of them have included great scientific research, and many of them have been of eminent practical value. They represent an immense amount of time, labour, and intellectual work. There is another reason why we have to thank the authors, namely, because of the important addition the papers will make to the Year-book of Pharmacy, published by the Conference. I propose that we cordially thank the gentlemen who have so kindly favoured us with papers at these meetings.

Mr. KINNINMONT: I have great pleasure in seconding the motion. I think we cannot be too grateful to gentlemen who have spent so much time in promoting the highest pharmacy, and in giving us the enjoyment we have experienced in listening to an account of their labours. I only hope we shall have as much information and enjoyment next year. Perhaps I may have something then to add respecting the Scotch system of apprenticeship.

The CHAIRMAN: I need scarcely say that I am sure you will all unanimously agree in thanking the authors of the papers. (Applause.)

THANKS TO THE LOCAL COMMITTEE.

Mr. SCHACHT: We have now arrived at a part of the proceedings of the Conference which becomes so systematic—but on this occasion part of a duty—as somewhat to have taken the position and attitude

of a form. But on no previous occasion has the task which I am now attempting to fulfil been a mere matter of formalism; for it has always been done with the utmost cordiality. We have been fortunate in having been received in the towns we have visited with a large amount of hospitality and the utmost enthusiasm by our fellow-members; and it has been a pleasant duty to thank those members for all the kindness they have shown, and for the admirable arrangements they made. But on no previous occasion could we more cordially unite in thanking the gentlemen who have been so very laborious in making the arrangements for the comfort of the members. (Applause.) The members of the local committee have exerted themselves greatly; and no one who was present at last night's entertainment, with the splendid liberality which we experienced, could fail to see how carefully they have attended to our pleasure. (Applause.) The grand spectacle (the *conversazione* in the Museum of Science and Art), which was offered to us was such as we could have only expected to have seen in the South Kensington Museum; in short, the whole reception was such as to reflect the highest credit on the pharmacists of the town. And other hospitalities I hear are in store for us. I have much pleasure in moving that the cordial thanks of this assembly and the non-resident members be given to Mr. Mackay, Mr. Baildon, and the other members of the local committee, for their successful efforts in organising the present meeting, and for the kind and thoughtful manner in which everything has been arranged. (Applause.)

Mr. SAVAGE: I have much pleasure in seconding the motion. Notwithstanding the cordiality with which this motion evidently will be adopted, I feel some misgivings, inasmuch as the Pharmaceutical Conference is to meet in Brighton next year, and I am afraid that we shall not be able to equal, much less excel the efforts made on the present occasion by Edinburgh.

Mr. ATKINS: I would desire to support the motion by one word. I am exceedingly glad to hear the complimentary and graceful remarks of Mr. Schacht in proposing the resolution. At any time it is a most agreeable thing to experience these northern hospitalities; but on this occasion the hospitality, both public and private, of Mr. Mackay, Mr. Baildon, and others, has been very great.

Professor ATTFIELD: From my official knowledge as secretary, I know something of the efforts that have been made by the gentlemen who have been mentioned, and by the local committee generally; and I cannot but support most heartily and most strongly the resolution which is before the meeting. Whether we remember the

comfort we are all enjoying in this room as a meeting-room in every way fitted for our purpose, or the convenience and pleasure which members have experienced in the quarters that have been assigned to them throughout the city, the splendid character of the *conversazione*, the kindness met with on all sides, and the great usefulness of the 4th page of the programme of proceedings—which is a complete guide to all places of interest in Edinburgh,—whether we consider public or private matters, it will be seen that great tact, power of organisation, and good-heartedness has been manifested. I cordially support the resolution.

The motion was put to the meeting and carried enthusiastically.

Mr. BAILDON returned thanks. He said: From the accident of my being chairman of the Local Committee, I acknowledge the motion thanking us for our humble attempt to give you a welcome. Anything we have done has been entirely a labour of love; and we are glad to find that our labours have been appreciated. On the part of the committee, I beg to thank you for the kind expression of your sentiments towards us.

ELECTION OF OFFICERS.

The CHAIRMAN: Before the office-bearers for the next year are elected, I must read this letter which I have received from Mr. Reynolds:—

“LEEDS, July 29th, 1871.

“My dear Mr. President,—The effects of my late accident incapacitate me from joining in the various gatherings, whether for business or social objects, which happily blend at our Annual Conferences.

“This deprivation causes me regrets, but they are greatly tempered by a consideration of the perfect success of our Association, and the belief that in the ‘Year-Book of Pharmacy’ the Conference has found a talisman which will secure the lasting adhesion of its large and rapidly-increasing roll of members.

“I have also to ask that I may not again be nominated as one of the General Secretaries.

“My fellow-members have a right to the statement respecting the past management of the Conference which I now desire to make. The general direction of its affairs has been in the hands of my brother secretary, Professor Attfield, and month by month

and year by year he has devoted his valuable time to its general guidance, and not less to the performance of the minute duties of routine, with a constancy, forethought, and method that has been simply perfect.

"Of the success of the present meeting, and its many pleasant circumstances, no one can feel a doubt who knows anything of the attractions of 'modern Athens,' and of the earnestness and executive abilities of our brethren who have offered us a welcome to the Conference.

"With grateful thanks to those colleagues and other fellow-members, to whom I am indebted for so many evidences of kindly feeling during an intercourse of eight years,

"I am, my dear Sir,

"Very faithfully yours,

"RICHD. REYNOLDS."

The Chairman then went on to say: The Committee last night met, and thought over a great number of names, and they have made up a list of officers for your acceptance, which I now submit to you. With respect to the resignation of Mr. Reynolds, I need scarcely say how much we regret his inability to continue in his office, and how much we appreciate what he has done for us.

Professor ATTFIELD: I feel it to be exceedingly awkward for one Secretary to praise another: it looks so very much like fishing for compliments; but I cannot let this letter pass without drawing the attention of the meeting to what sort of man we are losing. Mr. Reynolds was one of the three gentlemen who issued the original circular proposing the formation of the Conference; Mr. Brady, until a short time ago our Treasurer, was another; and it would be wrong in us to let these two men, who have done years of work, to drop quietly out of the way without recognising their great and self-sacrificing labours in connection with the Conference. This is the first year that Mr. Reynolds has not been at the left hand of the President. He was very anxious to be here, but, as no doubt you are aware, he met with an accident which has quite prevented him. To him you are indebted for those admirable *résumés* of the proceedings at every meeting up to the present one. He has quietly sat at the table taking short notes of the discussions that have occurred, and then with his admirable memory and racy writing furnished the "Transactions" with a complete report of the whole meeting. There was an immense amount of labour in that, and I think it is right that

you should know that he did it, and recognise his services. The production of the Year-Book at so early a period in the life of the Conference was chiefly due to his influence. I rather think that the notion of the Conference issuing such a work was mentioned in the very first speech by Mr. Deane, the father of the Conference, and the importance of such a volume was freely mentioned even before then. But it would not have been produced last year—you would have had to wait two or three years longer—but for Mr. Reynolds. I used to say to him—"We have not enough money;" but he would say—"Give the Year-Book, and you will get the money." I could not let this letter pass without alluding to the work and worth of a colleague with whom I worked from the first with a feeling of friendship which soon developed into respect and affection. I am glad to be able to say that Mr. Reynolds is still anxious to be on our roll of workers, and that he consents to be nominated as a Vice-President.

The PRESIDENT: From the way in which you have received these allusions to the labours of Mr. Reynolds, it would be a mere piece of formalism to pass a vote of thanks to that gentleman for his services to the Conference. We will simply ask Professor Attfield to convey to Mr. Reynolds a letter embodying the views that have been expressed, and stating that this meeting has recorded its sense of his worth in a tumult of applause more eloquent than the words of any resolution.

Professor ATTFIELD: I will now read the list of office-bearers proposed for the year. The names have been adopted by the Committee after a great deal of deliberation. Still it is a list open to improvement, and I am empowered to say that the Executive will gladly receive any further suggestions or propositions.

The following office-bearers were then unanimously elected:—

President.

H. B. BRADY, F.L.S., F.C.S., Newcastle-on-Tyne.

Vice-Presidents who have filled the office of President.

H. DEANE, F.L.S., Clapham Common, S.W.

Professor BENTLEY, F.L.S., M.R.C.S., 17, Bloomsbury Square, W.C.

D. HANBURY, F.R.S., F.L.S., Clapham Common, S.W.

W. W. STODDART, F.C.S., F.G.S., Bristol.

Vice-Presidents.

J. INCE, F.L.S., F.C.S., London.

R. REYNOLDS, F.C.S., Leeds.

J. WILLIAMS, F.C.S., London.

W. D. SAVAGE, Brighton.

Treasurer.

G. F. SCHACHT, Clifton, Bristol.

General Secretaries.

Professor ATTFIELD, PH.D., F.C.S., 17, Bloomsbury Square, W.C.
F. B. BENGER, 1, Market Place, Manchester.

Local Secretary.

T. GLAISTER, 11, North Street, Brighton.

Other Members of the Executive Committee, 1871-72.

M. CARTEIGHE, F.C.S., London.
T. B. GROVES, F.C.S., Weymouth.
F. SUTTON, F.C.S., Norwich.
C. EKIN, F.C.S., Bath.
J. MACKAY, F.C.S., Edinburgh.
T. GREENISH, F.C.S., London.
G. UMNEY, F.C.S., London.
F. C. CLAYTON, Birmingham.
W. SMITH, Brighton.

Auditors.

H. C. BAILDON, Edinburgh.
J. SCHWEITZER, Brighton.

A cordial vote of thanks was then awarded to the Chairman, and the proceedings of the Conference were brought to a close.

CONVERSAZIONE.

A conversazione in connection with the Conference was held in the evening in the Museum of Science and Art, at which about 1400 ladies and gentlemen were present. The proceedings commenced at eight o'clock. As each party arrived, they were received by the Local Committee, the following members of which were present:—H. C. Baildon, Chairman; G. Blanshard, Vice-Chairman; W. Ainslie and J. R. Young, Treasurers; J. Mackay, F.C.S., Secretary; W. Aitken, T. Fairgrieve, D. Kemp, J. Mackenzie, S. Macadam, Ph.D., F.R.S.E., A. Napier, W. Tait.

The following office-bearers were also present:—President—

W. W. Stoddart, F.C.S., F.G.S., Bristol; Vice-Presidents—H. Deane, F.L.S., Clapham, London, S.W.; D. Hanbury, F.R.S., F.L.S., Clapham, London, S.W.; J. Ince, F.L.S., F.C.S., London; J. Williams, F.C.S., London; Treasurer—George F. Schacht, Clifton, Bristol; General Secretary—Prof. Attfield, Ph.D., F.C.S., 17, Bloomsbury Square, W.C.; Assistant Secretary—James Collins, F.B.S.E.; Local Secretary—John Mackay, F.C.S.; Editor of the Year-Book—C. H. Wood, F.C.S.; other members of the Executive Committee—F. B. Bengier, Manchester; H. B. Brady, F.L.S., Newcastle-on-Tyne; M. Carteighe, F.C.S., London; H. Matthews, F.C.S., London.

Amongst those present, in addition to the above, were:—His Imperial Majesty the Emperor of Brazil, Sir George Gibb, Bart., and lady, General Macdonald and lady, Lieutenant-Colonel Forbes Leslie and lady, Major Kirk and lady, Captain Brurer and lady, Lieut. Stewart and lady, Lieut. P. D. Trotter and lady, Assistant-Commissary Chambers and lady, Prof. Crawford and lady, Prof. Macgregor and lady, Prof. Thorpe and lady, Prof. Swan and lady; Prof. Archer and lady, Prof. Attfield, Mrs. Baildon and the Misses Baildon, Prof. Duns and lady, Prof. Davidson and lady, Dr. Donaldson and lady, Rev. Dr. Mackay and lady, Rev. Dr. Gordon and lady, Rev. Dr. Johnstone and lady, Rev. Mr. Morton and lady, Rev. Mr. Paton and lady, Rev. J. L. Gardiner and lady, Rev. Mr. Graham and lady, Rev. Mr. Millar and lady, Rev. J. W. Cooms and lady, Rev. W. C. Kenith and lady, Rev. Mr. Thomson and lady, Rev. A. O. Brown and lady, Rev. Mr. Smith and lady, Rev. Mr. Fraser and lady, Rev. Mr. Armatage and lady, Rev. D. F. Ferguson, Rev. Walter Scott and lady, Rev. J. B. Ritchie and lady, Dr. Leadman, St. Ives, Headingley, Leeds, and lady; Dr. Lauder Lindsay, Perth, and lady; Dr. Andrew Wood and lady, Dr. Stevenson Macadam and lady, Dr. Ritchie and lady, Dr. Inglis and lady, Dr. Nachlot and lady, Dr. Carruthers and lady, Dr. Macleod and lady, Dr. Lillies and lady, Dr. Belloch and lady, Dr. Balfour and lady, Dr. Milne and ladies (2), Dr. Young and lady, Dr. Alexander Wood and lady, Dr. Dickson and Mrs. Crease, Dr. Proctor, Dr. Linton and lady, Dr. Angus Macdonald and lady, Dr. Maxton and lady, Dr. Combe and lady, Dr. Colquhoun and lady, Dr. Charles Bell and lady, Dr. Wilson and lady, Dr. Niven and lady, Dr. Keiller and lady, Dr. Douglas and lady, Dr. Grierson and lady, Dr. Burns, Dr. Thomson and lady, Dr. Charles Groves and lady, Dr. M'Gee and lady, Dr. Milburn and lady, Dr. Burt and lady, Dr. Dunlop and lady, Dr. C. R. A. Wright and lady, Dr.

Mackintosh and lady, Dr. Imlach and lady, Dr. Sinclair and lady, Dr. Macaulay and lady, Dr. Bremner and lady, Dr. Macbain and lady, Dr. James C. Fraser, Dr. Thatcher and lady, Dr. H. Savage, Ph.D., and lady; Dr. Forbes and lady, Dr. Maclaren and lady, Dr. Murray and lady, Dr. Roberts and lady, Dr. J. Knowsley Thornton and lady, Mr. James Young and Dr. William Craig and lady, Dr. Duncanson and lady, Dr. Carmichael and lady, Dr. Hogue and lady, Dr. Pridie and lady, Bailie Cousin and lady, Councillor Mitchell and Miss Mitchell, Mr. Russell, Dean of Guild, and lady; Mr. Marwick and lady, Mr. Robert Morham and lady, Mr. Hall, Moderator High Constable; Mr. Jas. J. Jamieson, S.S.C.; Hugh Watt, S.S.C.; Mr. Geo. C. Banks, S.S.C.; Mr. J. M. Anderson, S.S.C.; Mr. Wemyss Kennedy and lady, Mr. James Russell, Dundee; Mr. d'Oyly Grange and lady, Mr. Burnet Brown and lady, G. Blanshard and ladies, Mr. C. Bayne and lady, Mr. D. and Mr. H. Kirk and lady, Mr. Alfred H. Mason, F.C.S., and lady, Liverpool; Edward C. C. Stanford and lady, Mr. W. Ovison Macadam and lady, Mr. A. Forbes Irvine of Drum and lady, Mr. Robinson and lady, Mr. J. Schweitzer and lady, Mons. P. Sainton and lady, Mr. Munro, Clare Hall, and lady; Mr. Geikie and lady.

The halls of the Museum presented a very gay appearance from eight till eleven o'clock. In addition to the ordinary attractions to visitors to the Museum, the band of the 93rd Sutherland Highlanders was present, and performed selections of band and pipe music; and photographic exhibitions of Scottish scenery and buildings, by the aid of the oxy-hydrogen light, were given in the Lecture Hall, under the direction of Messrs. Nichol and Davies. Light refreshments were provided during the latter half of the evening. A feature of this department was the presence of an American summer beverage-making machine, which was surrounded by a thirsty group as long as it was able to produce a drop of the delectable liquids it is famed for. The assemblage began to dismiss at eleven o'clock, and by half-past eleven nearly all had left the Museum.

BRITISH PHARMACEUTICAL CONFERENCE.

DINNER.

The members of the British Pharmaceutical Conference and their friends dined together in Macgregor's Royal Hotel, Edinburgh, on the evening of Thursday, August 3rd. The Executive Committee

of the Conference were entertained by the Local Committee. There was a large attendance. Mr. Henry C. Baildon occupied the chair, and Mr. George Blanshard was croupier. On the right of the chairman were:—Mr. Stoddart, Bristol; Professor Archer, Edinburgh; Mr. Deane, Clapham; Mr. Schacht, Clifton; Mr. Hanbury, London; Mr. Williams, Dr. Paul, Mr. Matthews, Mr. Collins, and others. On the left were—Professor Attfield; Dr. Alexander Wood, Edinburgh; Mr. Hills, London; Professor Edwards, Montreal; Mr. John Mackay, Edinburgh; Mr. Flux, London; Dr. Stevenson Macadam, Edinburgh; Mr. Carteighe, Mr. Flux, Mr. Bengier, Mr. Wootton, Mr. Smith of St. Andrews, Mr. Shaw, Mr. Fraser, Glasgow, and others. A number of ladies were present.

After dinner, Mr. John Mackay, Edinburgh, said,—“Mr. Chairman, there are one or two letters of apology which I have to bring under your notice. One is from Dr. Christison, who regrets very much that he will be so much occupied during the British Association week as to be obliged very reluctantly to decline the invitation to dine with us. I have also a note from Professor Bentley. He says that in consequence of the severe accident which he sustained, he will not be able to be present. Dr. M'Lagan regrets that he will not be able to be present. Then follow several which I will not read: from the president of the Society; the ex-president, Mr. Sandford; Mr. Reynolds, Leeds; Mr. Brady, who is going to America; Mr. Sutton, Norwich; Mr. Groves, Weymouth; Mr. Martindale, of University College; Mr. Evans, Liverpool; Mr. Atherton, of Nottingham, and others.

After the usual loyal and patriotic toasts had been proposed, Mr. Blanshard responding for “The Army, Navy, and Volunteers,” the Chairman said: Gentlemen,—I request every one to fill a bumper to the toast of the evening,—“Success to the British Pharmaceutical Conference.” When we look back to the year 1863, when some dozen or fourteen gentlemen met in Newcastle, I do not think that any one of us, not even the patriarch of this Conference, who is on my right (Mr. Deane), was sanguine enough to believe that in 1871 we should have had anywhere such an assembly of members of the Conference as we have just had in the capital of Scotland. However, from such small beginnings the Conference has reached a membership roll of nearly 2000. And it has initiated a very important movement. Last year, the Conference issued “The Year-Book of Pharmacy.” (Cheers.) The Chemical Society has already copied our example; and those who were present at the inaugural address of Sir William Thomson last night are aware that a similar

undertaking is proposed to be carried out by the British Association. A copy of our Year-Book is given to every one of our members; and there can be no doubt it will assist considerably in carrying forward the objects of the Conference. Let us drink a bumper to the continued prosperity of the British Pharmaceutical Conference.

Mr. Stoddart, in reply, said: I thank you for the honour you have conferred on me in associating my name with this toast. I ceased to be President yesterday afternoon; but during my two years of office I did not, for I could not, work harder or more cheerfully for the Conference than I still intend to do. No doubt great success has already been achieved by the Conference; but when I glance at men around me, I suspect that eventually we shall become far more successful even than we are now. I have recently been told, by men older than myself, that one way or other, by these Conferences, scientific meetings, examinations, and so on, we are over-educating the pharmacist. This I totally deny. I say that if we can increase the general scientific knowledge, as well as the pharmaceutical knowledge of ourselves, our assistants, and the youths intrusted to our care, we are benefiting the public at large, as well as improving pharmacy. I believe that educated pharmacists, with the exception of medical men, have greater opportunities of making themselves useful to their fellow countrymen than any other class in the kingdom. We are warned by Dr. Farr that a most insidious enemy is approaching our shores at this moment; and it is the duty, as it is in the power, of every pharmacist to warn his fellow-citizens in this matter, and to recommend means whereby the enemy may be kept from English homes; for if science be science, we have simple and certain remedies for preventing this approach in the majority of cases. During the rage of epidemics, and in times of liability of infection, a man may be a most dangerous neighbour when he least suspects it. Then it is that the educated pharmacist tells the best way of preventing the diffusion of sickness; and in such and a hundred other ways does great good to his fellow-men. When you consider that most of the operations of daily life are chemical, a man cannot know too much of chemistry. Sound education prevents a man cramming himself with trashy information, and weakening his brain with trashy literature. At the present day, you cannot stop at a railway station without a boy asking if you will not purchase something or other in the way of a book; but how seldom is it that you meet with anything good! I would as soon give a youth a wrong dose of medicine, or something that would do

him harm, as put into his hands a second-rate, to say nothing of a tenth-rate, novel. I would warn all young pharmacists against such literature; and I think it my duty to do so from the experience I have had myself. When young, I subscribed to a library; and I believe that every four-and-twenty hours I "skimmed" over a three-volume novel. I can assure you that it has done me more injury than anything else, because I afterwards found immense difficulty in reading really good books, so greatly had my capability and capacity been damaged. I again repeat that we should extend our knowledge as far as practicable; it will make us better tradesmen, better neighbours, and better men ourselves. There is not a pharmacist who has not been benefited by the Pharmaceutical Society of Great Britain and the British Pharmaceutical Conference; let us each and all endeavour to repay the benefits, with interest, and the success of our Associations will be endless.

MR. BLANSHARD (Croupier): Ladies and gentlemen, in bringing the toast under your notice, "The Colleges of Physicians and Surgeons of this city," I venture to state that these two institutions are second to none in Europe. I need not here dilate on the good that has been effected by them, or descant on their merits, for they are well known throughout the country, and highly appreciated by us all. We have with us one of the "lions," I may call him, of one of these colleges. With the toast, therefore, I will couple his name. I propose "The Colleges of Physicians and Surgeons of Edinburgh, coupled with the name of Dr. Alexander Wood."

DR. ALEXANDER WOOD: Mr. Croupier, ladies and gentlemen,—I felt it a very high honour indeed, when I was invited to be present at this great gathering of a body so important, so interesting, and so successful as that which now dines together. My esteemed friend, Mr. Baidon, the chairman, has modestly told us that the British Association and the Chemical Society were copying from the Pharmacists, in the matter of a Year-Book. Why, I tell your chairman, and I tell you, that there is not an educating body in this country which might not be proud to copy your example. I have watched the progress of the Pharmaceutical Society for many years. I watched its progress at an early stage of its advancement; and I am not ashamed to say that I was then in an antagonistic position. But I have learned to see that you pharmacists have great ends to serve, and that you are serving them in an honourable manner. I speak especially of the education of those who are designed to be the pharmacists of the next generation; and I congratulate you on the manner in which you are seeking to perfect their education.

When I look at the rules and regulations, I see that you do not put your seed into unprepared soil ; but you make it ready to receive the seed of professional knowledge. In this you have set us medical men a great example. You have no old riveted prejudices to contend with ; but you have placed before you a *tabula rasa* on which to put your ideas, and well and nobly you have put them. Speaking now not so much on behalf of the College of Physicians and the College of Surgeons, as on behalf of the Medical Council, I feel that having fought there for the preliminary education of the medical student, my hands are strengthened by what you pharmacists have done. I feel it will be impossible for a medical man to hold his own with the small modicum of training which he generally has. I must sincerely congratulate you on the movement which inaugurated this Conference. I congratulate you on the meetings you have just held, the proceedings of which I have read with the greatest pleasure. I never saw such steady devotion to work as you have exhibited in your Conference. You began early and finished late. I looked over the papers, and I saw none but what excited interest. The subjects were admirable. I see you have taken up one of the greatest difficulties which we and you are bound to contend with. I mean the apprentice system. You have not solved that, but you have laid down the elements which will eventually prove the solution of it. I feel that in all our efforts at education now-a-days, an error which you have perceived and fought against is, that it is imagined that everything is to be taught by lecturing. The human mind is looked upon as a tin pitcher, into which every kind of food is to be poured, and that it must contain them all. My idea is, that God has constructed our minds not to be mere receptacles for knowledge, but to grasp at knowledge ; and that by accepting this position, we will be the best educators, and be able to teach a man to put his hands to seize at knowledge, and to appropriate it for himself. I think that you have shown an example to much more pretentious bodies. I do most sincerely thank you for the honour done to the colleges by this toast, and for the honour done to myself in being at this board ; and I really assure you I reciprocate the sentiments of every surgeon in Edinburgh when I bid this Pharmaceutical Conference and the Pharmaceutical Society of Great Britain God speed from the bottom of my heart.

The CHAIRMAN : I have much pleasure in expressing our sincere thanks to Dr. Alexander Wood for the very able and kind way in which he has recognised the Conference, and the labours of pharmacists in promoting the cause of sound education. That such

sentiments should have come from a gentleman not connected with us renders them doubly gratifying.

Mr. FLUX, London, said—I beg to propose the “Health of the Officers of the British Pharmaceutical Conference.” I feel that it is impossible for me to do justice to the toast. This is the first occasion on which I have been privileged to be present at the meetings of this association; and I must say that it has been a real pleasure to me to see how the work of the Society has been done. I cannot but feel that the Conference is doing for the British public in general good service. It is doing at the same time great service to those who are at present pharmacists, and those who will afterwards become so. Now, the efficiency of such a society must depend greatly on its officers; and I think it is fortunate in having such good men to serve it. I could refer to those who have served it as presidents; but they will be brought under your notice afterwards. He who is just elected president, is not with us; he is about to go to America; and he has our best wishes that his journey may result in improved health to himself, and the advancement of pharmacy. I sincerely trust also that the health of our new Vice-president, Mr. Reynolds, will soon be restored. Of the Local Secretary, Mr. Mackay, too much cannot be said. A better organizer of the Edinburgh meeting could not have been found, and a more genial host cannot possibly exist. Then we could not get on so well without a treasurer. The receipt of moneys may be easy, but their proper expenditure must be a matter of difficulty. That they are expended most efficiently, we all know; and that Mr. Schacht contributes great strength to the Executive Committee, is well known. As to Dr. Attfield, you have endless opportunities of seeing the admirable way in which he performs his many duties. Altogether, nothing could be more efficient than the way in which the work of this Conference is done by its officers; and I hope they will have continued success in their endeavours. I beg to propose “The Officers of the British Pharmaceutical Conference,” coupled with the health of Mr. Schacht and Dr. Attfield.

Mr. SCHACHT: Ladies and gentlemen, it is not the first time I have had such an honour as this put upon me; and the result has always been with a considerable mixture of feeling on my part. I have felt and now feel greatly pleased at any compliment paid to my fellow-workers; but I fear that the honour is much greater than anything we have been able to achieve for the Society. Inasmuch, as I have held the nominal office of treasurer this year, I have come in for a part of the compliments; but I have done little or nothing.

I am associated with Professor Attfield, on whom has fallen the sole labour of this part of the work of the Association. He has fulfilled most splendidly the duties of honorary secretary; but he has also taken upon himself that very large mass of duties which, until they were transferred to him, were so admirably performed by our president, Mr. Brady. When the number of members was small, the work was done *con amore* by Henry Brady; but when the Society reorganized itself by the institution of the "Year-Book," and the members began largely to increase, those two circumstances rendered it necessary that there should be centralised action—that the management of the Society should be in one centre. The way that the work has been performed at that centre, and at the meetings, you scarcely need to be reminded of; but as for myself, I have only had a small share of the duties of the Executive Committee. I receive the compliment warmly; and I am obliged to all those who took part in it.

Professor ATTFIELD: Ladies and gentlemen, I do most humbly beg to apologise for taking such a lion's share of the work in this Conference; but the fact is that whenever you have a society receiving from its members subscriptions, and giving to its members a *quid pro quo*, the whole of such work must of necessity go through the hands of one man; hence it is from the force of circumstances, that I have to do a good deal of secretarial work and treasurer's work too. Now my time is short, for in twelve minutes I must be on my way to London, whence, however, I hope to return in two or three days for a ramble through the glorious Highlands of Scotland. But I should like to say a word or two. You have wished health to a great many people who are apparently very well already and bid fair to continue so, and you have drank to the health of the Conference, which, I am glad to say, is also in splendid condition. But in wishing me health, you exhibit no trace of supererogation and you are really doing what you wish to do. For at the end of a session of the School of Pharmacy in which we have had more pupils than ever, and at the end of a Conference which has been the most successful we have had,—a fact which you will be glad to know,—I am feeling very tired, and my brain is sluggish, and even if I had time I should not be able to get out many ideas. But your kind wishes stimulate and invigorate me very greatly, and for this I am thankful to you as well as for your recognition of my labours. It has well been said that pride in performance, pleasure at success, and gratification at applause, are the broad human motives which govern men everywhere. I cannot ex-

press to you how proud I am in the performance of the duties you have assigned to me. So long as the Conference keeps steadily in view its chief object, namely, the prosecution of original research and the promotion of good fellowship amongst pharmacists—so long you will find me, whether as secretary or in the more humble position of member, endeavouring to do all I can to promote its best interests. Nor can I find words to describe my pleasure in the success of the Conference. A very few years ago our numbers could be counted by tens, but now we muster not only hundreds but thousands. In this success I have quite as much reward as I wish for. At the same time I cannot but admit that I am gratified at the applause with which you received the mention of my name and the allusion to my labours. I thank you personally and on behalf of my colleagues.

Dr. Attfield having left the meeting,

The CHAIRMAN said, I am sure I echo the wishes of all present in suggesting a course which is not laid down on the programme. I propose that we should give a special bumper to Professor Attfield for his invaluable services to the Conference.

Mr. STODDART: Allow me to endorse what the chairman has said. I have had two years experience as President, and I can assure you that we are greatly indebted to Dr. Attfield for the success of the Conference. I think that we should give him a cordial bumper.

The proposal was enthusiastically agreed to.

Professor ARCHER: I beg to propose "Prosperity to the Pharmaceutical Society of Great Britain." You have done me the honour to place in my hands a toast for the proposing of which I have no qualification except the well-known one that I have always, from the very first commencement of the Society, had an intense feeling in its favour. There has been much said on the subject to-night, not exactly with respect to the Pharmaceutical Society itself, but with respect to the Pharmaceutical Conference; and I think it has come to this that we cannot separate the one from the other. The Pharmaceutical Conference is only a sort of natural result of the prosperity and success of the Pharmaceutical Society. The one has grown out of the other; the one could not have existed but for the other. In this splendid assembly I see an indication of which there can be no possible doubt, that the British Pharmaceutical Conference is already on its high road to prosperity. In proposing the "Success of the Pharmaceutical Society," I have a very easy task to perform. The success of the Society is perfectly assured. It has been brought to its present position by an amount of zeal which no human being can possibly dispute or be blind to. I have kept a

very close watch on the proceedings of the Society from first to last. I am not able to tell you how much my interest was excited by it; and I am exceedingly sorry to see, what all of you must see, that when it came to a certain point of success individual proclivities began to spring up. Now we must keep to solidarity of feeling in this matter, and not be led by the whims and feelings of any special member. We have great objects to fight for as members of the Society; and they can only be accomplished by all putting their shoulders to the wheel and laying aside individual feeling. It is important to you and infinitely more important to the public of Great Britain. You, in conjunction with the medical profession, have to a large extent the lives of Her Majesty's subjects, to use technical language, in your hands; and your objects can only be secured by your working energetically and collectively. I hope that in future we shall have no difference of opinion as to the proper mode of carrying on the business of so important an Association. I propose "Prosperity to the Pharmaceutical Society of Great Britain."

Mr. T. H. HILLS replied. He said I have to thank you for the honour you have done me in associating my name with the toast of "Prosperity to the Pharmaceutical Society of Great Britain." 'Of that great Society I believe I was the first Associate. I am therefore fairly called upon to return thanks because of my long connection with the Society. Another reason is, I suppose, that I am treasurer of that Society. The members of the Pharmaceutical Society put a great deal of trust in me, and I am proud of their confidence. Ladies and gentlemen, we have heard speeches relating to the Society from one of the most eminent members of the Colleges of Surgeons and Physicians in Edinburgh, and from Professor Archer. They have given us great encouragement, and I think deservedly, for the Society has endeavoured to work out some important problems. But we must not be led away from doing still more on that account, for much yet remains to be done. And, as Professor Archer has said, let us go forward unanimously, and with that good feeling in which we have striven for so many years. I have no doubt myself that the Society will continue to progress, and that we shall accomplish what we have in contemplation, not only for the advantage of ourselves, but for the good of the public.

The CHAIRMAN: I beg now to propose that you should drink to "The Memory of the Founder of the Pharmaceutical Society." He was a man who devoted his life, energies, and purse, and made great sacrifices to found the Pharmaceutical Society of Great Britain. He succeeded in doing this, and we have now the pleasure of seeing the

result. I do not think that at any meeting of this kind we should omit the recognition of his labours. We cannot over-estimate the services which Jacob Bell has rendered in improving the state of Pharmacy in this kingdom.

The toast was drunk in solemn silence.

Mr. DEANE then said—Ladies and gentlemen, the toast I have to propose is “The Edinburgh Committee of the Conference.” You will well agree with me that the hospitality, the general organisation, and everything connected with the meeting have been most effectually carried out. I think there is no one here present who has had personal experience as I have had in this matter, but will have noticed the great amount of labour that has been bestowed on the preparations for the Edinburgh meeting of the Conference. The success of the annual meetings of the Conference has always depended, to a considerable extent, on the exertions of the local committee; nay, it is obvious that without much local labour, our Conference would have been anything but the great success it is, and the admirable exertions of such men as Mr. Reynolds, Mr. Brady, Professor Attfield, would have been rendered less useful. In your name I wish success, health, and happiness to the Edinburgh Committee, and I couple with the toast the names of Baildon and Mr. John Mackay.

Mr. BAILDON: Mr. Mackay and myself and the local committee are more than satisfied in this kind recognition of our services by our esteemed friend Mr. Deane and by our visitors. I may say that work has been, on the part of myself, Mr. Mackay, and the Committee, a labour of delight. We anxiously wished that the Conference should meet here last year; and then we would have done what we have now tried to do, namely, make it a successful meeting. I am gratified to find that we have arrived at that result, and none more greatly than ourselves will rejoice in the continued prosperity of the Conference.

Mr. MACKAY.—Along with Mr. Baildon and on the part of the local committee, I have to thank Mr. Deane and the gentlemen round this table for so kindly noticing our labours. I am a modest man, but I am not going to deny that a considerable amount of work was connected with the preliminary arrangements for the meeting of the Conference in Edinburgh. I can truly assert that our worthy chairman of the Committee and myself found the task not an easy one. I am sincere in saying that the committee view with pleasure and pride, not only the assemblage which we have round this table to-night, but that attending the meetings on Tuesday and Wednes-

day. We are proud to have such an assembly in Edinburgh. I am safe in saying that at no previous meeting of the Pharmaceutical Conference have there been more interesting and scientific papers read than at the meetings on Tuesday and Wednesday. And in connection with the special proceedings of the Conference, there may be named the assemblage of ladies and gentlemen who honoured the Edinburgh Local Committee with their presence in the Museum of Science and Art on Tuesday evening. I have no doubt that the visit to that noble institution will live for many a day in the recollection of those who were there. Although in the toast of the Local Committee, Professor Archer's name was not mentioned, yet we are very much indebted to the Professor for the efforts which he made to render the *conversazione* a success. Mr. Hills never made a truer remark than when he said that Professor Archer, in all things relating to the Pharmaceutical Society, never grudged any labour. Indeed, he might have as his motto, "Aye ready," in regard to the Pharmaceutical Society. I beg again to return thanks.

Mr. J. R. YOUNG said, Notwithstanding the variety and importance of the toasts which have been proposed to-night, I must claim for the one which has been assigned to me a position of some importance. It is good logic to say that if we had had no visitors we should have had no meeting; and in consequence we should not have enjoyed the pleasure and profit we have had during the last two days. Certainly when we ascertained that the Pharmaceutical Conference was to meet in Edinburgh, we felt that it would be becoming in us to give the members such a reception as it was in our power to do. We had heard of the doings that had taken place in Liverpool, and we felt that there were some things about Edinburgh very attractive indeed to strangers; and we supposed that it would be possible to make the meetings such as to bring a considerable congregation of visitors to Edinburgh. I am very glad to gather from what has been stated to-night that the Conference has been one of the most successful that has yet been held, and that the papers have been on the whole most satisfactory, such being the case, I think that the Committee are rewarded and are very much indebted to the visitors who have favoured us with their presence. We have visitors in large numbers from the metropolis of England, gentlemen who occupy a very high position in the Pharmaceutical Society, a Society we all honour, for many of us are indebted to that Society for the education we have received in connection with the calling we pursue. We have in addition visitors from districts north, south, east and west of that metropolis, and I am sure that my Scotch

brethren agree with me that it was and is our duty to do honour to them. The toast is to be responded to by a most distinguished visitor, Henry Deane. I had the pleasure of seeing him for the first time at the meeting in Dundee. The impression on my mind was such as you all seem to hold regarding him, one calling forth respect and esteem.

Mr. DEANE said: In rising to respond to the toast of "The Visitors," and the kind manner in which you have drunk to it, I may be allowed to refer to the time when this Association was formed. I was asked by a few energetic young men to take the head of a table on the occasion of the institution of this Association. I hesitated for some time; but as I knew there were some differences of opinion between those who were within the Society and those who were without, and as I reflected that it is "a good and a pleasant thing to dwell together in unity," it occurred to me that by assuming the position which I was requested to assume, I and those I have mentioned might in an indirect way bring about unity in opinion and action. I am happy to say that the object I had in view on that occasion has been realised. At the commencement we were few, but we have gone on increasing from time to time, till we have now nineteen hundred members. Those members are being increased through the idea that originated at the first meeting,—that it would be most desirable, if possible, to publish annually a *résumé* of all the work that has been done in connection with pharmacy. Through the energy of Mr. Brady, Mr. Reynolds, and Professor Attfield, without whom our Association would have scarcely existed so long as it has done, we have arrived at that position that we can safely say that we are established on a safe basis. I have no doubt that by continuing these meetings, proper love and friendship will continue on all sides. It was formerly a great curse to pharmacy, that there was a constant state of jealousy amongst its followers. In each town and street every one was afraid of his neighbour; but from the example of interchange of communication initiated by the Conference, neighbours now call more frequently upon one another, and speak on points on which they have common interests. Original research has also been very much promoted. Allow me again to return thanks for the kind way in which the toast has been given and responded to.

Mr. HILLS also returned thanks. After a brief reference to his long acquaintanceship with Mr. Mackay, he said he never was more warmly received anywhere than he had been on his present visit to Edinburgh, and he thanked Mr. Mackay and the other members of the Local Committee for their kindness towards him.

Dr. EDWARDS said he had come as far as any man present, and he was glad to accept the position of a visitor, as being a resident in Montreal. He congratulated the Conference on the success which had attended it on this occasion.

Mr. HILLS: I beg to propose "The Ladies," who have graced our meeting with their presence. (Applause.) I think they have paid us a great compliment. I hope that at future dinners we may be equally honoured.

Mr. HANBURY: I propose "The Pharmaceutical Associations of America and Canada." Though I do not yield to anybody in my appreciation of the kind hospitality we have experienced in this city, yet I have a grudge against the compiler of this programme. The toast which I have to propose is marked No. 10, hence I am supposed to admit that we have nine toasts of greater importance than this one, and that I cannot allow. When we remember that the Pharmaceutical Associations which we have formed on both sides of the Atlantic have resulted in the most agreeable friendships, and the advancement of pharmaceutical research, we may well wish prosperity to the Associations of America and Canada. In connection with the toast I may mention the name of Dr. Edwards, of Montreal.

Dr. EDWARDS said he had been associated with the Pharmaceutical Society, with the Chemists' Association of Liverpool, and with the Conference from an early period of its existence, as well as with meetings, in the extreme East and West, of the American associations. In all these he had felt that they were one brotherhood, serving not only to advance their common profession, but the welfare of mankind. From the experience he had had, he was convinced that it was only by harmonious laws that they could be kept moving. He concluded by returning thanks for the manner in which the toast had been proposed and received.

Mr. CARTEIGHE: I will now propose "Success to the Pharmaceutical Press," coupled with the names of Dr. Paul and Mr. C. H. Wootton. In doing so I would only remark, that we look to them to keep up the character which the press of this country does really enjoy, and also to assist in preventing the infringement of those laws of harmony which Dr. Edwards has just alluded to.

Dr. PAUL: I thank you most heartily for the toast you have just drunk, and for the honour you have done me in coupling my name with it. I venture to think that it is an expression of approval of the part we have taken during the last year in connection with Pharmaceutical literature. Since the time the Conference last

met, I have had an opportunity of learning that the editorial chair is not altogether a bed of roses. It has an admixture of thorns which renders it occasionally an inconvenient position; but it has not been such as to leave me much the worse. I feel that I cannot omit to perform a duty which I owe to some who are present, and some who have left the room. To say that I understand that coupling my name with the toast is simply an expression of approval of what services I myself have rendered, I should be assuming a credit and reward which does not belong to me; for since the time I have conducted the *Pharmaceutical Journal*, I have been very zealously and very ably assisted by several gentlemen. One of these was an old friend, and I could look to him because it was in his nature to render a friend assistance. The others were strangers to me at first; but now I know them I do not wonder that they should have sacrificed their convenience as they have done. In conclusion, I wish to express my sincere sense of gratitude to all the friends who, sometimes to their own inconvenience, have rendered assistance which I could not have done without.

Mr. WOOTTON: Although I have only a very small share in this toast, and cannot take much honour to myself, I can cordially acknowledge the sincere and hearty Scotch manner in which the toast has been drunk by the Edinburgh chemists; and as far as it relates to the paper I represent, I have to return my very sincere thanks. It only remains for me to say that the Pharmaceutical press will have a very hard race indeed to keep up with the British Pharmaceutical Conference, if it goes on in the very brilliant manner which has characterised the present meetings.

Mr. STODDART: I beg now to propose "The health of the Chairman." Our friend, Mr. Baildon, of whom I cannot speak too highly, has conducted this gathering most successfully. I would therefore ask you to fill your glasses and drink to his good health.

The CHAIRMAN: I can only say from the bottom of my heart, that I thank you very much indeed for the very kind observations made in proposing the toast, and for the very cordial response given to it.

Mr. WILLIAMS proposed "The Croupier." He said: I would simply propose "The Croupier," for Mr. Blanshard is so well known that his merits do not require any enlargement on my part.

The CROUPIER: I am very much indebted to you for your kind expression of feeling towards me. I thank you sincerely.

The proceedings were enlivened by some excellent songs; and the evening throughout was spent in a very pleasant manner.

INDEX.

A.

- Acacia Catechu**, Cutch from : Dumaine, 59.
Accident in Distilling Ether, 221.
Acetate of Morphia in Solution, Decomposition of, 290.
Acetic Acid, Impure, 262.
Acetone in Methylated Spirit, 220.
Acetum Cantharidis, 349.
Achillea Moschata (Iva), 89.
Acid, Acetic, Impure, 262.
 ,, Aromatic Sulphuric, 350.
 ,, Benzoic and Benzoin, 251.
 ,, Carbohc for Burns, 430.
 ,, Carbohc, Ointment of, 421.
 ,, Carbohc Pills, 390.
 ,, Citric, New Source of, 263.
 ,, Cyclopic, a new Fluorescent Substance, 264.
Acid, Glycocholic, Improved way of obtaining, 330.
Acid Hydrobromic Aqueous, Sp. Gr. of, 160.
Acid Hydrobromic, Prep. of, 160.
 ,, Oxalates of Potassium, Ammonium and Sodium, 262.
Acid Pyrogallie, Oxidation of, 266.
 ,, Rufigallie, 265.
 ,, Sulphocarbohc and the Sulphocarbohcates, 254 and 257.
Acid Sulphurous, as disinfectant, 154.
 ,, Tartaric, Prevention of Mouldiness in Solutions of, 262.
Acid Uric : Gibbs, 330.
Acids, strong, Filtration of, 310.
Aconite Alkaloids, 298.
Acridine, a new Alkaloid, 304.
Activity of Conium, Schroff, 98.
 ,, of Leaves, Variability of, 22.
Address, President's, 535.
Adulteration of Carbonate of Soda, 167.
 ,, Catechu, 59.
 ,, Chiretta : Webb, 92.
 ,, Copaiva, Detection of, 64.
 ,, Lard, 437.
 ,, Oils, to detect, 326.
 ,, Saffron : Hanbury, 102.
Agoniada and Agonidine, 308.
Aguiar, A. De, and A. Bayer : A new Solvent for Indigotin, 322.
Ailanthus Excelsa : Daji, 43.
Albumen, Constitution of, 329.
 ,, in the Urine, Confirmatory Test for, 329.
Alcohol, Benzylie, from Balsam of Peru, 250.
Alcohol, in Chloroform and Chloral Hydrate, 237.
Alcohol, Solubility of Sulphide of Carbon in, 156.
Alcoholate of Chloral and Chloral Hydrate, 235.
Aldehyd, Action of Chlorine on, 242.
 ,, Conversion of Chloral into, 243.
Alder, Black, or Rhamnus Frangula, Bark of, 560.
Alkalies, a new Reagent for : M. Boettger, 167.
Alkaloid, a new ; Acridine, 804.
 ,, from Cinchona Bark, hitherto undescribed, 278.
Alkaloid of the Fly Fungus, Muscarin, 309.
Alkaloids of Aconite, 298.
 ,, new, of Opium, 291.
 ,, in Plants of the Family Boraginæ, 310.
Allen, A. H. : Permanganate of Potassium of Pharmacy, 564.
Almond Flavour, 442.
 ,, Oil, Bitter, Tests for Purity : Flückiger, 65.
Almonds, Emulsion of, 354.
Aloes, Crystalline Principles of, 577.
Aloin, Notes on, 585.
Alum, Manufacture of, 178.
Aluminium, Chloride of, as a new Antiseptic, 177.
Amandine, 442.
America, Opium Cultivation in : Kennedy, 33.
America, Poppy Culture in, 36.
American Sumac, 45.
Ammoniacal Salts, Estimation of, 151.
Ammonia, Spiritus Aromaticus, 399.
Ammon-Magnesia, Sulphate of, Occurrence of, 168.
Ammonium, Acid Oxalates of : Nichols, 262.

- Ammonium Carbonate and Carbamate, Reaction with Calc. Chlor., 150.
 Ammonium Carbonates, Divers, 130.
 Amyl, Nitrite of, 223, 224, 225.
 Amylo-Nitrous Ether (Nitrite of Amyl), 225.
 Analysis of Berberis Berries : E. Lensen, 24.
 Annual Report, 530.
 Antimony, Golden Sulphide of, 178.
 "Apprenticeship," Pharmaceutical Ethics, 606.
 Aqua Amygdalarum Amararum, 352.
 Arachis Hypogæa, 59.
 Arbutin from Uva Ursi, 304.
 Archibald, H. C. : Granular Salt of Citrate of Magnesia, 263.
 Argemone Mexicana, 87.
 Armstrong, H. G. : Action of Sulphuric Acid on Narcotine and Codeine, 296.
 Aromatic Sulphuric Acid, 350.
 Arsenic in Phosphorus : Rademacher, 159.
 Arsenic, Purifying Metallic, 159.
 Asagrea Officialis (Sabadilla), 106.
 Asclepias Asthmatica, 93.
 Asthma, Hay, Seaweed, a Remedy for, 431.
 Atkins, S. R. : Pharmaceutical Ethics, re "Apprenticeship, 606.
 Attfield, J. : Chemical Nomenclature of Pharmacopœia, 117.
 Australia, Cultivation of Opium in : Ward, 32.
- B.
- Baidon, H. C. : The Bark of Rhamnus Frangula, 560.
 Baking Powders, 438.
 Balsam of Copaiva, Detection of Adulteration in, 64.
 Balsam of Peru, Benzyllic Alcohol from, 250.
 Bark, Cinchona, Determination of Alkaloids in, 268, 272.
 Bark, Cinchona, Effect of Light and Air on Alkaloids contained in, 271.
 Bark, Cinchona, Polarised Light for Determining Value of, 273.
 Bark, Cinchona, Sugar in Preparations of, 404.
 Bark, Cinchona, Undescribed Alkaloid in, 278.
 Bark, Cinchona, Valuation of : P. Carles, 268.
 Bark of Cinchona, Wine of, 422.
 Bark, White Cinchona, Paytime in, 281.
 „ of Rhamnus Frangula, or Black Alder, 560.
- Barnes, J. B. : Infusions of the Pharmacopœia, 378.
 Bartholdy, M. and Martius : Chloral, 240.
 Bartholow, R. : Gelsemium Semper-virens, 96.
 Baryta, Carbonate of, Preparation of, 169.
 Bateman, T. H. : Ung. Sabina, 430.
 Battery, Practical, for Electro-Therapeutics, 346.
 Baudrimont, E. : Use of Tinfoil for preserving Substances liable to change on exposure to Air, 422.
 Bayer, A., and A. De Aguiar : a new Solvent for Indigotin, 322.
 Beale, L. S. : Glycerine Solutions of Pepsin, etc., 331.
 Beck, Dr. : Cod Liver Oil Saponified by Lime, 396.
 Beetroot Distillation and Sugar-Beets, 200.
 Beetroot, Extraction of Sugar from : Kohn, 201.
 Bell, C. A. : Iodate of Iron, 175.
 Benzoating of Ointments, Extemporaneous, 417.
 Benzoin and Benzoic Acid : Loeve, 251.
 Benzyllic Alcohol from Balsam of Peru, 250.
 Berberis Vulgaris, Analysis of Berries : E. Lensen, 24.
 Bibliography—
 Chemical Philosophy : J. P. Cooke, 453.
 Lecture Notes for Chemical Students : Frankland, 457.
 Laboratory Text-Book : Valentin, 460.
 Introduction to Inorganic Chemistry, 462.
 Chemistry, Gen., Med., and Pharm. : Attfield, 463.
 Handbook of Physics : Rossiter, 463.
 Select Methods Chemical Analysis, 463.
 Qualitative Analysis : Galloway, 464.
 Quantitative Analysis : Fresenius, 464.
 Laboratory Guide : Church, 465.
 British Homœopathic Pharmacopœia, 465.
 Manual of Botany : Bentley, 466.
 Elementary Botany : Hentfrey, 467.
 Student's Flora : Hooker, 467.
 Binkerd, A. D. : Carbolic Acid Solution for Burns, 429.
 Birdwood : Olibanum or Frankincense, 48.
 Bismuthi, Liquor, Preparation of, 614.

- Bismuthi, Subcarbonas: T. P. Blunt, 179.
 Bismuthi Subnitrates, Report on Specimens of, 180.
 Bismuthi Subnitrate, Reaction of Potassium Iodide in, 181.
 Black Lustre Colour for Sugar Paper, 447.
 Black Phosphorus: Blondlot, 157.
 Bleaching Sponges, 448.
 Blistering Flies in Hydrophobia, 566.
 Blondlot: Black Phosphorus, 157.
 Blue Pill: Diehl, 387.
 Blunt, T. P.: Bismuthi Subcarbonas, 179.
 Boettger: Preparation of Peroxide of Silver, 188.
 Boettger: On a New Reagent for Alkalies, 167.
 Bolas, T.: Distillation and Boiling Point of Glycerine, 248.
 Bolas and Groves: Tetrabromide of Carbon, 162.
 Bolton, C. F.: Extemporaneous Benzoining of Ointments, 417.
 Bones of Paralytic Patients, 170.
 " Substitution of Salts composing, 170.
 Boraginæ, Family of, Alkaloids in Plants of, 310.
 Boswellia (Olibanum): Birdwood, 48.
 Bottlers, Protection to, 576.
 Boucharlat, G.: Artificial Production of Dulcitol, 216.
 Bouland, M. L.: Confirmatory Test for Albumen in Urine, 329.
 Bower, H. A.: Unguentum Hydrargyri Oxidi Rubri, 419.
 Brass, Copper, and Iron, Method of Tinning, etc., 449.
 British Pharmaceutical Conference, 529.
 " " Constitution and Rules, 471.
 British Pharmaceutical Conference, Dinner, 627.
 Bromal and its By-products, 244.
 " Hydrate of, 244.
 " Hydrate, Experiments with, 245.
 Bromide of Potassium, Purity of, 163.
 " of Sodium, Preparation of: Castelha, 161.
 Bromide, Chloride, and Iodide of Silver, Solubility of, 187.
 Bromides of Quinine, Morphine, and Strychnine, Syrups of, 287.
 Brown, J. C.: Bones of Paralytic Patients, 170.
 Brownen, G.: Waters of the British Pharmacopœia, 350.
 Bruckner: Impure Acetic Acid, 262.
 Burns, Carbolic Acid for, 430.
 Bursell, F. A.: Nitrite of Amyl, 223.
 Butyric Acid, Test for, in Glycerine, 249.
 C.
 Calabar Bean, Tincture of, 414.
 Calcis Lacto-phosphatis, Syrupus, 411.
 Calcium Chloride, Reaction with Ammon. Carbonate and Carbamate, 150.
 Calcium, Iodide of, and Syrup of: O. Eberbach, 165.
 California Castor Oil, 100.
 " Sulphur Beds of, 158.
 Calomel for Hypodermic use, 431.
 " Preparation of, 185.
 Camomile, Blue Oil of: J. Kachler, 89.
 Camphor, Pulverization of, 391.
 " Rubini's, 434.
 Cane-sugar, Saline Compounds of, 206.
 Cantharides, Inefficiency of Immature, 19.
 Cantharides in Hydrophobia, 566.
 Cantharidine, Solubility of, 318.
 Cantharidis, Acetum, 349.
 Caoutchouc, Liquid, as an Addition to Plasters, 355.
 Caraway Flavour, 438.
 Carbolic Acid for Burns, 430.
 " " in Smallpox Epidemics, 253.
 Carbolic Acid, Ointment of, 421.
 Carbon, Sulphide, Solubility in Alcohol, 156.
 Carbon, Tetrabromide of: Bolas and Groves, 162.
 Carbonate of Baryta, Preparation of, 169.
 Carbonate of Soda, Adulteration of, 167.
 Carbonates of Ammonium: Divers, 130.
 Carles, P.: Effect of Light and Air on Alkaloids of Cinchona Bark, 271.
 Carles, P.: Valuation of Cinchona Barks, 268.
 Carles, P.: Vanilla Crystals, 319.
 Caro and Gräbe: Acridine, a new Alkaloid, 304.
 Carre, F. T.: New Material for Suppositories, 402.
 Carstens, J. H.: Iodoform, 246.
 Carteighe, M.: Syrup of Phosphate of Iron, etc., 407.
 Castelha: the Preparation of Bromide of Sodium, 161.
 Castor Oil, Behaviour with Petroleum Oils, 101.
 Castor Oil, Californian, 100.
 " " Circular Polarisation of: Popp, 101.

- Castor Oil Soap, 393.
 Catechu, Adulteration of, 59.
 Caustic, a New, Ethylate of Potassium, 222.
 Caustic Soda, Pure, 166.
 Celery Flavour, 438.
 Cellulose and Starch, 188.
 Cement, Liquid, 448.
 „ for Indiarubber, 447.
 Centaury, American, Erythrocentaurin in, 311.
 Ceratum Sabinæ, 420.
 Ceylon, Cinchona Cultivation in, 86.
 Champion & Pellet: Prep. Hydrobromic Acid, 160.
 Chemical Gas Furnace: Griffin, 340.
 Chemical Nomenclature of Pharmacopœia, 117.
 China, Opium Trade in: J. R. Jackson, 25.
 China, Opium Trade in: Simmonds, 27.
 Chinese Blistering Flies: F. P. Smith, 17.
 Chinese Native Opium, 30.
 Chilblains, Lotions for, 429.
 „ Sulphurous Acid for, 428.
 Chiretta: Flückiger and Höhn, 91.
 „ Adulteration of: E. A. Webb, 92.
 Chloral, 240.
 Chloral Hydrate, its Use, 238.
 „ Commercial, Examination of, 554.
 Chloral Hydrate, Palatable, 427.
 „ Purification of, 230.
 „ Test for, 232, 233, 235, 237.
 Chloral Hydrate and Chloral Alcoholate, 235.
 Chloral Hydrate and Chloroform, Detection of Alcohol in, 237.
 Chloral, Conversion of, into Aldehyd, 243.
 Chloral, Preparation of, 226, 230.
 „ and Strychnine, 431.
 „ of Trade, Report of, 551.
 Chloride of Aluminium as a new Antiseptic, 177.
 Chloride, Bromide, and Iodide of Silver, Solubility of, 187.
 Chloride of Ferro-ethylene, 221.
 „ of Gold: Debray, 188.
 „ Mercurous, Preparation of, 185.
 „ Silver, Reduction of, 186.
 Chlorine, Action of, on Aldehyd, 242.
 Chloroform and Chloral Hydrate, Detection of Alcohol in, 237.
 Chloroform, English, 247.
 „ Glycerine, for the Internal Administration of, 377.
 Chloroform, Reaction of: Hofmann, 247.
 Chloroform for Improving the Taste of Cod Liver Oil, 427.
 Church, A. H.: Cyclopic Acid, a new Fluorescent Substance, 264.
 Cimicifuga Racemosa, a Neutral Principle in, 313.
 Cinchona Bark, Alkaloid from, hitherto undescribed, 278.
 Cinchona Bark, Effect of Light and Air on Alkaloids of, 271.
 Cinchona Bark, Determination of Alkaloids in, 268, 272.
 Cinchona Bark, Sugar in Preparations of, 404.
 Cinchona Bark, White, Paytine, an Alkaloid in, 281.
 Cinchona Bark, Wine of, 422.
 „ Polarised Light for Determining Value of, 273.
 Cinchona Bark, Valuation of, 268.
 Cinchona, Syrup of, 404.
 Cinchona Cultivation in Ceylon, 86.
 „ „ „ Granada (New), 72.
 Cinchona Cultivation in India, 83.
 „ „ „ Jamaica, 74.
 „ „ „ Java, 74.
 „ „ „ Martinique, 73.
 „ „ „ Mexico, 74.
 „ „ „ Venezuela, 72.
 „ Ferrated Elixir of, 385.
 Cinchonæ Flavæ, Extractum Liquidum, 376.
 Cinchonine and Quinine, Hydrobromates of, 285.
 Cincho-Quinine, 285.
 Cinnamon Flavour, 439.
 Citric Acid, New Source of, 263.
 Citrate of Magnesia, Granular Salt of, 263.
 Claassen, B. G.: Vacciniin from the Leaves of the Cowberry, 312.
 Claviceps Purpurea: M. C. Cooke, 111.
 Cloves, Flavour of, 439.
 „ Oil of, Tests for Purity: Flückiger, 65.
 Cochineal, Testing, 323.
 Cocoa-nut, Medicinal Properties of: Jackson, 104.
 Codeia, New Derivatives from: C. R. A. Wright, 548.
 Codeine and Narcotine, Action of Sulphuric Acid on, 298.
 Cod Liver Oil, Chloroform for Improving the Taste of, 427.
 Cod Liver Oil, Newfoundland, 19.
 „ Removal of the Odour and Taste of, 427.

- Cod Liver Oil, Saponified by Lime, 396.
 Collodion, Morphia, 352.
 " Preparation of, 219.
 " Vesicating, 352.
 " " and Liquor Epis-
 pasticus, 381.
 Collodium Mercuriale, 352.
 Commercial Carbonate of Ammonia :
 Divers, 146.
 Commercial Palm Oils : Guyot, 105.
 " Phosphorus, Arsenic in,
 159.
 Conard, T. E. : A Neutral Principle in
 Black Snakeroot, 313.
 Condereau, C. A. : Food of Infants, 437.
 Confection of Senna : Ehrmann, 353.
 Conference, British Pharmaceutical,
 529.
 Conference, British Pharmaceutical,
 Dinner of, 627.
 Conference, British Pharmaceutical,
 Constitution and Rules, 471.
 Conference, British Pharmaceutical,
 Conversazione, 625.
 Conia, Synthesis of : Schiff, 301.
 Conium Fruit, fresh, Extract of, 356.
 " Maculatum, Activity of : Von
 Schroff, 98.
 Cooke, M. C. : Development of Ergot,
 111.
 Cooke, M. C. : Guarana, 41.
 " " Medicinal Ferns, 106.
 " " Zylphora Asthmatica,
 93.
 Cooke, M. A. : Variability in Activity
 of Leaves, 22.
 Copaiba Jelly, 353.
 Copaiva Balsam, Detection of Adult :
 Hager, 64.
 Copper, Brass, and Iron, Method of Tin-
 ning, etc., 449.
 Coriaria Ruscifolia, Poisonous Prin-
 ciple of, 325.
 Corn, Grape-Sugar from, 208.
 Cowberry, Vacciniin from the Leaves of,
 312.
 Crab Orchard Salt : J. T. Viley, 167.
 Creuse, J. : Carbonate of Baryta, 169.
 " " Liq. Ferri Persulphatis,
 176.
 Creuse, J. : on Sulphocarbolic Acid and
 the Sulphocarbonates, 257.
 Croci, Syrupus, 405.
 Crotonic Chloral : Kræmer and Pinner,
 242.
 Crystalline Principles of Aloes, 577.
 Crystallisation of Sulphocarbonate of
 Quinia, 260.
 Crystals, Vanilla : Carles, 319.
 Cucumber Ointment, 421.
 Culinary Essences, 438.
 Cultivation of Cinchona, 72.
 " " Ipecacuanha in India,
 86.
 Cultivation of Opium in China, 27-30.
 " " in America : Ken-
 nedy, 33.
 Cultivation of Opium in China : Jack-
 son : 25.
 Cultivation of Opium in Australia :
 Ward, 32.
 Cultivation of Opium in Wurtemberg,
 31.
 Cultivation of Poppy in America, 36.
 Curcumin : Daube, 323.
 Cutch from Acacia Catechu : Dumaine,
 59.
 Cyclopic Acid, a new Fluorescent Sub-
 stance, 264.
 Cytisin, 301.

 D.
 Daji, M. : Ailanthus Excelsa, 43.
 Daube, F. W. : Curcumin the colouring
 matter of Turmeric Root, 323.
 Debray, H. : Chloride of Gold, 188.
 " " Solubility of Chloride,
 Bromide and Iodide of Silver, 187.
 Decoction of Ailanthus, 44.
 Decolorization and Deodorization of
 Tincture of Iodine, 413.
 Defresne, M. T. : Syrup of Cinchona,
 404.
 Deherain, P. P. : Movement of Prin-
 ciples in Plants, 24.
 Deschamps, M. : Double Tartrate of
 Sesquioxide of Manganese and Potash,
 263.
 Detection of Turmeric in Mustard and
 Rhubarb : Maisch, 100.
 Development of Ergot : Cooke, 111.
 Dewar, J. : Inverted Sugar, 204.
 Dextrin Insoluble in Water, 197.
 " Purification of, 199.
 Dichloroallylene, 243.
 Diehl, C. L. : Blue Pill, 387.
 " " Carbolic Acid Pills, 390.
 " " Quinia Pills, 389.
 Digestion, Experiments on, 337.
 Digitalis, Time for Collecting : Schnei-
 der, 97.
 Dinner of British Pharmaceutical Con-
 ference, 627.
 Disinfectant, Sulphurous Acid as, 154.
 Distillation in partial Vacuo, 342.
 Distilled Water, to obtain economically,
 602.
 Divers, E. : Ammonium Carbonates,
 130.
 Divers, E. : Reaction of Ammon. Car-

- bonate and Carbamate with Calc. Chlor., 150.
 Divers, E. : Salts of Nitrous-oxide, 152.
 " " Spiritus Ammonia Aromaticus, 397.
 Division of Powders by the Eye, 437.
 Donovan, M. : Tincture of Hyoscyamus, 412.
 Dougall, J. : Experiments with Bromal Hydrate, 245.
 Dover's Powder, Improved, 391.
 Draper, H. N. : Behaviour of Castor Oil with Petroleum Oils, 101.
 Drops, Dutch, or Haarlem, 435.
 Dubarth's Disinfectant, 253.
 Dubarth and Rolle : Carbolic Acid in Smallpox Epidemics, 253.
 Dulcite, Artificial Production of, 216.
 Dumaine, C. : Cutch from Acacia Catechu, 59.
 Duquesnel, H. : Glycero Extracts, 359.
 Dutch Drops or Haarlem Drops, 435.
- E.**
- Eau de Millefleurs, 445.
 Eberbach, O. : Iodide of Calcium and Syrup of Iodide of Calcium, 165.
 Eberle, C. S. : Use of Wax, Tallow, etc., in Suppositories, 400.
 Ebert, A. E. : Ceratum Sabinæ, 420.
 " " Coating of Pills, 390.
 " " Malt Extract, 357.
 " " Ointment of Iodide of Sulphur, 421.
 Ebert, A. E. : Pills of Oil of Sandal Wood, 389.
 Ebert, A. E. : Tincture of Calabar Bean, 414.
 Edinburgh, Meeting at, 1871, 529.
 Ehrmann, J. W. : Aromatic Sulphuric Acid, 350.
 Ehrmann, J. W. : Confection of Senna, 353.
 Elaterium : Dr. Köhler, 71.
 Election of Officers, 622.
 Electro-Therapeutists, Practical Battery for, 346.
 Elixir of Cinchona, Ferrated, 385.
 Emulsion of Almonds : Reynolds, 354.
 Epispasticus, Liquor, and Vesicating Collodion, 381.
 Ergot, Development of : Cooke, 111.
 Ernst, A. : Sabadilla, 106.
 Erythrocentaurin in American Centaury, 311.
 Erythrocentaurin in Erythraa Chilensis, 311.
 Essences, Culinary, 438.
 Essence of Ginger, Aromatic, 433.
 " of Moss Rose, 445.
- Ether, Amylo Nitrous (Nitrite of Amyl), 225.
 Ether, Accident in Distilling, 221.
 " Triethylic, 222.
 Ethics, Pharmaceutical, *re* " Apprenticeship," 606.
 Ethylate of Potassium ; a new Caustic, 222.
 Eucalyptus Globulus, its Use in Medicine, 68.
 Evaporation in Vacuo, 344.
 Ewing, W. G. : Preparation of Suppositories, 399.
 Extract of Aconite Root, Fluid, 372.
 " " Ailanthus, 45.
 " " Belladonna Root, Fluid, 372.
 " " Cimicifuga, Fluid, 373.
 " " Conium Seed, 373.
 " " Dandelion, Fluid, 375.
 " " Ergot, Fluid, 373.
 " " Fresh Conium Fruit, 356.
 " " Ginger, Fluid, 375.
 " " Hellebore, Fluid, 375.
 " " Ipecac., Fluid, 374.
 " " Malt : Ebert, 357.
 " " Wild Cherry Bark, Fluid, 374.
 " " Pareira, Fluid, 374.
 " " Sarsa, Fluid, 374.
 " " Senna, Fluid, 374.
 " " Uva Ursi, Fluid, 375.
 " " Valerian, Fluid, 375.
 Extracts, Fluid : Mill, 360.
 " Fluid and their Menstrua, 363.
 " Glycero : Duquesnel, 359.
 " Sulpho-carbonic : Lafort, 357.
 Extractum Buchu Fluidum, 361, 372.
 " Cinchonæ Fluidum, 362, 373, 376.
 Extractum Hyoscyami Fluidum, 362.
 " Physostigmatis, 356.
 " Rhei Fluidum, 362, 374.
- F.**
- Fabourin : Hæmatosine, 328.
 Farr, A. : Lime Juice and Pepsin, 334.
 Fats, Melting and Solidifying Points of, 326.
 Ferns, Medicinal : Cooke, 106.
 Ferrated Elixir of Cinchona, 385.
 Ferri Liq. Persulphatis : J. Creuse, 176.
 Ferri cyanide of Potassium, Action of Light on, 268.
 Ferri cyanide of Potassium, Preparation of, 266.
 Ferro-ethylene, Chloride of, 221.
 Ferruginous Sugar, 173.
 Filtering Medium, Parchment Paper as, 338.
 Filtration of Strong Acids, 340.
 Fitz, A. : Oil of Grape Kernels, 42.

- Flavours, Various Fruit and Culinary, 438.
- Fleischer, A.: Isomeric Modification of Sulphocyanide of Potassium, 268.
- Flies, Chinese Blistering: F. P. Smith, 17.
- Florida Water, 445.
- Flückiger, F. A.: The Crystalline Principles of Aloes, 577.
- Flückiger, F. A., Fluorescence of Peppermint Oil, 99.
- Flückiger, F. A.: Purification of Chloral Hydrate, 230.
- Flückiger, Rhatany from Para, 39.
- " Starch and Cellulose, 188.
- " Tests for Purity of Ess. Oils of Almonds and Cloves, 65.
- Flückiger, F. A.: Wild Rue or Hermal Seeds, 600.
- Flückiger and Höhn: Ophelia Chirayta, 91.
- Fluid Extracts: Mill, 360.
- " and their Menstrua, 363.
- Fluorescence of Peppermint Oil, 99.
- Fontainea Panheri: Heckel, 102.
- Food of Infants, 437.
- Foster, M.: Glycerine Extracts of Pepsine and other Ferments, 331.
- Frankincense, or Olibanum: Birdwood, 48.
- Fredigke, C.: Extract. Physostigmatis, 356.
- Fredigke, C.: Liquor Sedativus, 434.
- " Unguentum Acidi Carbolici, 241.
- Freezing and Ventilating Machine, 449.
- Fremy, E.: Oxy-ammonia, 151.
- Fruh, C.: Preserv. Oils of Lemon and Orange, 43.
- Fungus, Fly, Muscarin the Alkaloid of, 309.
- Furnace, Chemical Gas: Griffin, 340.
- Furniture Cream, 446.
- G.
- Gaboon, Ordeal Poison of, 61.
- Galangal, Historical Notes on, 103.
- Ganteine for Cleaning Kid Gloves, 457.
- Gas Furnace, Chemical: Griffin, 340.
- Gas, Hydrogen, Preparation of, 130.
- Gelsemium Sempervirens: R. Bartholow, 96.
- Gerard, A. W.: Extractum Cinchonæ Flavæ Liquidum, 376.
- Gerard, A. W.: Mould for Suppositories and Pessaries, 403.
- Gerhard, Saccharate of Iron, 171.
- Gibbs, W.: Uric Acid, 330.
- Gill, C. H.: Saline Compounds of Cane-Sugar, 206.
- Ginger, Aromatic Essence of, 433.
- Ginger Flavour, 439.
- Gingilie Oil, 98.
- Ginseng: J. R. Jackson, 67.
- Girard, A.: Oxidation of Pyrogallie Acid, 266.
- Gloves, Kid, Ganteine for Cleaning, 447.
- Glucose, 208.
- " Cane-sugar, Levulose, etc., etc., 215.
- Glucose: A. Joy, 209.
- Glycerine, Distillation and Boiling-point of, 248.
- Glycerine Extracts of Pepsine and other Ferments, 331.
- Glycerine, for the Internal Administration of Chloroform, 377.
- Glycerine Jelly, 443.
- " and Lime-juice, 441.
- " Specific Gravity of Solutions of, 248.
- Glycerine Solutions of Pepsin, etc., 331.
- " Test for Butyric Acid in, 249.
- " and Tannin Pencils, 430.
- Glycero Extracts: Duquesnel, 359.
- Glycerol of Lupulin, 377.
- Glycocholic Acid, Improved Way of Obtaining, 330.
- Glycyrrhizin: J. Hirsch, 217.
- Godfrey, H. E.: Ung. Aq. Rosæ, 435.
- Gold, Chloride of: Debray, 188.
- Gorup-Besanez, E. V.: Method of obtaining Glycocholic Acid, 330.
- Gorup-Besanez and F. Grimm: Synthesis of Oil of Rue, 249.
- Gräbe and Caro: Acridine, a new Alkaloid, 304.
- Grager, Dr., Reduction of Silver Chloride, 186.
- Granada, New, Cinchona Cultivation in, 72.
- Grape Kernels, Oil of: Fitz, 42.
- Grape-sugar, Formation of, in Syrups, 212.
- Grape-sugar, from Corn, 208.
- " New Method of Determining, 214.
- Greenish, T.: Linseed and Linseed Meal, 590.
- Griffin, C.: Chemical Gas Furnace, 340.
- Grimm, F. and Gorup-Besanez: Synthesis of Oil of Rue, 249.
- Groves and Bolas: Tetrabromide of Carbon, 162.
- Groves, T. B.: on Solutions, 568.
- " H.: Use of Blistering Flies in Hydrophobia, 566.
- Guaiaac Resin, Solution of, for Medicinal Use, 383.
- Guarana: M. C. Cooke, 41.

- Guava, 69.
 Guichard: Preparation of Collodion, 219.
 Gutta Percha, Pure White, Preparation of, 328.
 Guyot, P.: Palm Oils of Commerce, 105.
 Guy, T. O.: Sulphocarbolic Acid and the Sulphocarbolates, 254.
- H.
- Habermann and Hlasiwetz: Sugars various, 215.
 Hæmatosine, a New Medicine, 328.
 Hager, Dr.: Alkaloids in Cinchona Bark, Determination of, 272.
 Hager, Dr.: Chloroform for improving the Taste of Cod Liver Oil, 427.
 Hager, H.: Detection of Adult. in Copaiva, 64.
 Hager: Detection of Alcohol in Chloroform and Chloral-hydrate, 237.
 Hager, Dr.: English Chloroform, 247.
 " Purification of Dextrin, 199.
 " Syrup of Phospho-lactate of Lime, 411.
 Hair Dye, Morfit's, 441.
 Hair Washes, 441.
 Hanbury, Dr.: Adulteration of Saffron, 102.
 Hanbury, D.: Historical Notes on Galangal, 103.
 Hardy, M.: Formation of Grape-sugar in Syrups, 212.
 Harley, J.: Extract of Fresh Conium Fruit, 356.
 Harley, J.: Solution of Santonine, 384.
 Harmal Seeds: Flückiger, 577.
 Hay Asthma, Seaweed a Remedy for, 431.
 Heckel, Dr.: Fontainea Pancheri, 102.
 Hesse, O.: New Alkaloids of Opium, 291.
 Hesse, O.: Paricine, 282.
 " On Paytine in the White Cinchona Bark, 281.
 Hesse, O.: The Wax of Opium, 297.
 Hibiscus Abelmoschus: Jackson, 37.
 Hibiscus Esculentus: Jackson, 37.
 Hirsch, J.: Artificial Production of Mannite, 216.
 Hirsch, J.: Glycyrrhizin, 217.
 Hlasiwetz and Habermann: Sugars, various, 215.
 Hoehn and Reichardt: Composition, etc., of Hyoscyamine, 300.
 Hofmann, A. W.: a Reaction of Chloroform, 247.
 Höhn and Flückiger, Ophelia Chirayta, 91.
 Holbeck Tincture, 434.
 Honey of Rhatany Root, 436.
 Hoppe-Seyler: Lactic Acid from Sugar, 261.
 Hornemann and Koehler: Soluble Peroxide of Iron, 172.
 Howard, D.: an Alkaloid from Cinchona Bark, 278.
 Howard, J. E.: Cinchona Cultivation, 77.
 Huneker, J. F.: Erythrocentaurin in American Centaury, 311.
 Huechys Vesicatoria, 18.
 Husemann, T.: the Aconite Alkaloids, 298.
 Hydrargyri Oxid. Rub., Ointment of, 419.
 Hydrate of Bromal, 244.
 " Bromal, Experiments with, 245.
 " of Chloral, palatable, 427.
 " of Chloral, Test for, 232 and 233.
 Hydrate, Chloral, its use, 238.
 " Chloral, Purification of, 230.
 " of Soda, Crystallised, 167.
 Hydrobromic Acid, Aqueous, Sp. Gr. of, 160.
 Hydrobromic Acid, Prep. of, 160.
 Hydrobromates of Quinine and Cinchonine, 285.
 Hydrocyanate of Morphia, 291.
 Hydrogen Gas, Preparation of, 130.
 " and Iron, 171.
 Hydrophobia, Blistering Flies in: H. Groves, 566.
 Hyoscyamine, Composition and Preparation of, 300.
 Hyoscyamus, Tincture of, 412.
 Hypodermic Injection, 432.
 Hypodermic Use, Calomel for, 431.
 Hyposulphites, Composition of: Letts, 155.
- I.
- Icaja, or M'boundou: Rabuteau and Peyre, 61.
 Impurities in Reduced Iron, 171.
 India, Cultivation of Ipecacuanha in, 86.
 India, Cinchona Cultivation in, 83.
 Indiarubber, Cements for, 447.
 Indigotin, a New Solvent for, 322.
 " Solvents for, 322.
 Infants' Food, 437.
 Infusion of Ailanthus, 45.
 Infusions of the Pharmacopœia, 378.
 Ingham, J.: Adulteration of Saffron, 102.
 Injection Hypodermic, 432.
 " Hypodermic, Solution of Quinine for, 431.

- Injection of Permanganate of Potash, 428.
 Ink, Indelible, 448.
 Insect Poison, New, 441.
 Inulin and its Modifications, 191.
 Inuloid, a Soluble Modification of Inulin, 194.
 Iodate of Iron, 175.
 Iodide of Calcium, and Syrup of: O. Eberbach, 165.
 Iodide of Potassium, Precipitation of Quinia by, 283.
 Iodide of Potassium, Purity of, 163.
 „ Potassic, Reaction of, with Subnitrate of Bismuth, 181.
 Iodide of Starch, Soluble, 190.
 „ Sulphur, Ointment of, 421.
 Iodine, Decolorization and Deodorization of Tincture of, 413.
 Iodoform, 246.
 Iron, Brass, and Copper, Method of Tinning, etc., 449.
 Iron, Dialyzed Oxide of, 173.
 „ Hydrogen: Klein, 171.
 „ Iodate of, 175.
 „ Mixture, Compound of the Pharmacopœia, 560.
 Iron, Oxide, Syrup of, 173.
 „ Reduced, Impurities in, 171.
 „ Saccharate of, 171.
 „ Syrup of Phosphate of, etc., 407.
 „ Syrup of Phosphate of, with Manganese, 409.
 Iron, Soap, 394.
 „ Soluble Peroxide of, 172.
 „ Succinate of Sesquioxide of, 436.
 „ Volumetric Estimation of Persalt of, 177.
 Ipecacuanha, Cultivation in India, 86.
 „ Senega and Squill, Syrup of, 405.
 Ipecacuanha, Syrup of, 406.
 Iva (Achillea Moschata), 89.
- J.
- Jackson, J. R.: Ginseng, 67.
 „ Medicinal Properties of Cocoa-nut, 104.
 Jackson, J. R.: Ochro and Musk Mallow, 37.
 Jackson, J. R.: Opium Trade in China, 25.
 Jackson, J. R.: Tamarind, 59.
 Jalap, Tampico, Resin of, 320.
 Jamaica, Cinchona Cultivation in, 74.
 Java, Cinchona Cultivation in, 74.
 Jelly, Copaiba, 353.
 Jones, W. R.: Aromatic Essence of Ginger, 433.
- Joy, A.: Glucose, 209.
 Jungmann, J.: Arbutin from Uva Ursi, 304.
- K.
- Kachler, J.: Benzyllic Alcohol from Balsam of Peru, 250.
 Kachler, J.: Blue Oil of Camomile, 89.
 „ Chloride of Ferro-ethylene, 221.
 Kannal, E.: Glycerole of Lupulin, 377.
 Keaton, B. D.: Improved Dover's Powder, 391.
 Kellam, S.: Liq. Plumbi Subacetatis, 182.
 Keller: Riga Pine, 102.
 Kennedy, G. W.: Opium Cultivation in America, 33.
 Kennedy, G. W.: Syrupus Croei, 405.
 Kiemeier, Dr.: Black Lustre Colour for Sugar-paper, 447.
 Kinkad, J. R.: Combined Solution of Pepsin and Pancreatin, 332.
 Klein, Dr.: Hydrogen and Iron, 171.
 Knapp, C.: New Method of Determining Grape Sugar, 214.
 Koch, H.: Wax Varnish for Waxed Paper, 447.
 Koehler & Hornemann: Soluble Peroxide of Iron, 172.
 Köhler, Dr.: Monordica Elaterium, 71.
 Kohn, F.: Extraction of Sugar from Beetroot and Cane, 201.
 Kopp, E.: To Prevent Wooden Taps from Cracking, etc., 449.
 Koppe and Schmiedeberg: Muscarin the Alkaloid of the Fly Fungus, 309.
 Koumiss, 20.
 Kræmer and Pinner: Action of Chlorine on Aldehyd, 242.
 Krameria Triandra, from Para: Flückiger, 39.
- L.
- Lactic Acid from Sugar, 261.
 Lahache: Syrup of Iodide of Potassium and Iron, 411.
 Lard, Adulteration of, 437.
 Latour, M.: Hydrobromates of Quinine and Cinchonine, 285.
 Lead in Tinfoil, 424.
 Lead, Preparation of Subacetate of, 182.
 Leaves, Variability in Activity of: Cooke, 22.
 Lefort, M.: Sulphocarbonic Extracts, 357.
 Lefranc: Inulin and its Modifications, 191.

- Lemon Flavour, 439.
 „ and Orange Oils, Preserv. of :
 Fruh, 43.
 Lemon, Parasite on, 43.
 Lensesen, E. : Analysis of Berberis
 Berries, 24.
 Letts, E. A. : Composition of Hypo-
 sulphites, 155.
 Levulose, Glucose, etc., etc., 215.
 Light, Action of, on Red Prussiate of
 Potash, 268.
 Light, Polarised, for Determining Value
 of Cinchona Barks, 273.
 Lime Juice and Glycerine, 441.
 „ and Pepsin, 334.
 Lime, Syrup of Phospho Lactate of, 411.
 Lime and Iron, Syrup of Phosphate of,
 409.
 Linimentum Rubrum, 435.
 Linseed and Linseed Meal, 590.
 Liquid Cement, 448.
 Liquor Bismuthi, Preparation of, 614.
 „ Epispasticus and Vesicating
 Collodion, 381.
 Liquor Ferri Tersulphatis, and Liq.
 Ferri Subsulphatis, 176.
 Liquor Plumbi Subacetatis, 182.
 „ Sedativus, 434.
 Löwe, J. : Benzoic Acid and Benzoin,
 251.
 Löwe, J. : Ruffigallie Acid, 265.
 „ New Test Solution for Sugar,
 213.
 Lorinser : Eucalyptus Globulus in
 Medicine, 68.
 Lotions for Chilblains, 429.
 Lungershausen : Sumbulus Moschatus,
 88.
 Lupulin, Glycerole of, 377.
 Lustre, Black, for Paper, 447.
 Lyons, A. B. : Sulphocarbolate of Zinc,
 258.
- M.**
- Machin, F. J. : Linimentum Rubrum,
 435.
 Machine, Freezing and Ventilating,
 449.
 Macmillan : Decolorization, etc., of
 Tincture of Iodine, 413.
 Magnesia, Granular Citrate of, 263.
 „ Used as an Antidote, Influ-
 ence of Sugar on, 169.
 Maisch, J. M. : Amylo-Nitrous Ether
 (Nitrite of Amyl), 225.
 Maisch, J. M. : Decomposition of Ace-
 tate of Morphia in Solution, 290.
 Maisch, J. M. : Detection of Turmeric
 in Mustard and Rhubarb, 100.
 Maisch, J. M. : Hydrocyanate of
 Morphia, 291.
 Maisch, J. M. : Precipitation of Quinia
 by Iodide of Potassium, 283.
 Maisch, J. M. : Seeds of Strychnos, 94.
 Mallow, Musk, and Ochro : Jackson,
 37.
 Malt Extract, 357.
 Manganese and Potash, Tartrate of :
 Deschamps, 263.
 Manganese, Syrup of Phosphate of, 409.
 Mannite, Artificial Production of, 216.
 Martindale, W. : Spiritus Ammonie
 Aromaticus, 399.
 Martinique, Cinchona Cultivation in,
 73.
 Martius and M. Bartholdy : Chloral,
 240.
 Mason, A. H. : Report of the Chloral
 of Trade, 551.
 M'boundou, or Icaja : Rabuteau and
 Peyre, 61.
 Meat, Preservation of : Dr. Paul, 573.
 Medicated Prunes, 437.
 Medicinal Ferns : Cooke, 106.
 Meeting at Edinburgh, 1871, 529.
 Méhu, C. : Erythrocentaurin in Ery-
 thraa Chilensis, 311.
 Members, List of, 472.
 „ New and Honorary, 530.
 Mercurio Nitrate, Ointment of, 418.
 Mercurous Chloride, Preparation of,
 186.
 Merrick, J. M. : Testing Cochineal,
 323.
 Metallic Arsenic, Purifying, 159.
 Methylated Spirit, Acetone in, 220.
 Mexico, Cinchona, Cultivation in, 74.
 Milk of Roses, 443.
 Millefleurs, Eau de, 445.
 Mill, J. W. : Fluid Extracts, 360.
 Miller, J. T. : Spiritus Ammonie Aro-
 maticus, 398.
 Mixture, Compound Iron, of the Phar-
 macopœia, 560.
 Monordica Elaterium : Köhler, 71.
 Monkey Nuts, 59.
 Moore, J. P. : Tincture of Nux Vomica,
 414.
 Morfit's Hair Dye, 441.
 Morphia, Acetate of, in Solution, De-
 composition of, 290.
 Morphia Collodion, 352.
 „ Hydrocyanate of, 291.
 Morphine, Strychnine, and Quinine,
 Syrups of Bromides of, 287.
 Morphimetric Process for the Pharma-
 copœia, 287.
 Mould for Suppositories and Pessaries,
 403.

Muir, M. P.: Examination of Commercial Chloral Hydrate, 554.
 Mullein Plant, 96.
 Muscarin, the Alkaloid of the Fly Fungus, 309.
 Musculus, M.: Dextrin Insoluble in Water, 197.
 Musk Mallow and Ochro: Jackson, 37.
 Mustard and Rhubarb, Detection of Turmeric in: Maisch, 100.
 Mustard Seed, White, Sinalbin a Constituent of, 317.
 Mylabris Cichorii, 17.
 Myrrh, Tincture of, Utilisation of Residue in Making, 436.

N.

Narcotine and Codeine, Action of Sulphuric Acid on, 298.
 Naschold, H.: Sanguinarin, 310.
 Nataloin: Flückiger, 577.
 Nærgaard, W.: Syrupus Calcis Lactophosphatis, 411.
 Nering, M.: Preparation of Subacetate of Lead, 182.
 Newfoundland Cod Liver Oil, 19.
 Nichols, W. R.: Acid Oxalates of Alkalies, 262.
 Nitrate of Amyl, 223, 224, and 225.
 Nitrous Oxide, Salts of: Divers, 152.
 Nomenclature, Chemical, of Pharmacopœia, 117.
 Nomenclature of the Pharmacopœia, Proposed Changes, 616.
 Nut, Cocoa, Medicinal Properties of, 104.
 Nutmegs, Flavour of, 439.
 Nuts, Monkey, 59.
 Nux Vomica, Tincture of, 414.

O.

Ochro and Musk Mallow: Jackson, 37.
 Officers, Election of, 622.
 Oil, Blue, of Camomile: Kachler, 89.
 Oil, Castor, Behaviour with Petroleum Oils, 101.
 Oil, Castor, Californian, 100.
 „ „ Circular Polarisation of: Popp, 101.
 Oil, Castor, Soap of, 393.
 Oil, Cod Liver, Chloroform with, 427.
 „ „ Removal of the Odour and Taste of, 427.
 Oil, Cod Liver, Saponified by Lime, 396.
 Oil Essential, of Orange Peel, Oxidation Products of, 546.
 Oil, Gingilie, 98.
 „ Newfoundland Cod Liver, 19.
 „ of Grape Kernels: Fitz, 42.

Oil, Peppermint, Fluorescence of, 99.
 „ of Rue, Synthesis of, 249.
 „ Sandal Wood, Pills of, 389.
 Oils, Essential, of Cloves and Almonds, Tests for Purity, 65.
 Oils of Lemon and Orange, Preservation of: Fruh, 43.
 Oils, Palm, of Commerce: P. Guyot, 105.
 Oils, to Detect Adulterations of, 326.
 „ White, 435.
 Ointment of Mercuric Nitrate, 418.
 „ of Iodide of Sulphur, 421.
 „ Cucumber, 421.
 Ointments, Extemporaneous Benzoating of, 417.
 Oldberg, O.: Preparation of Calomel, 185.
 Olibanum, or Frankincense: Birdwood, 48.
 Ophelia Chirayta: Flückiger and Höhn, 91.
 Opium, New Alkaloids of, 291.
 „ Assay of: Procter, 287.
 „ Cultivation in America: Kennedy, 33.
 Opium, Cultivation in Australia: Ward, 32.
 Opium, Trade and Cultivation in China: J. R. Jackson, 25.
 Opium, Chinese Native, 30.
 „ Cultivation in Wurtemberg, 81.
 „ Trade in China: P. L. Simmonds, 27.
 Opium, Wax of, 297.
 Orange Flavour, 439.
 Orange Peel, Essential Oil of, Oxidation Products of, 546.
 Orange and Lemon, Preserv. of: Fruh, 43.
 Ordeal Poison, M'boundou, or Icaja, 61.
 Oxalates, Acid, of Potassium, Ammonium, and Sodium, 262.
 Oxide of Iron, Dialyzed, 173.
 Oxide, Iron, Syrup of, 173.
 Oxy-ammonia: E. Fremy, 151.

P.

Palm Oils of Commerce: P. Guyot, 105.
 Panax Schinseng, 67.
 Pancreatin and Pepsin, Combined Solution of, 332.
 Para Rhatany: Flückiger, 39.
 Paraffin Oils, Behaviour of Castor Oil with, 101.
 Paralytic Patients, Bones of, 170.
 Parasite on Lemon, 43.

- Parchment Paper as a Filtering Medium, 338.
 Paricine, 282.
 Pastile Paper, 446.
 Paul, Dr. : Preservation of Meat, 572.
 Paullinia Sorbilis, Guarana : Cooke, 41.
 Pavesi, C. : Removal of the Odour and Taste of Cod Liver Oil, 427.
 Paytine, an Alkaloid in the White Cinchona Bark, 281.
 Peckold, P. : Agonida and Agonidine, 308.
 Pellet and Champion : Prep. Hydrobromic Acid, 160.
 Pencils, Tannin and Glycerine, 430.
 Peppermint Oil, Fluorescence of, 99.
 Pepsin, etc., Glycerine Solutions of, 331.
 Pepsin and Lime-juice, 334.
 " Liquid and Saccharated, 332.
 " and Pancreatin, Combined Solution of, 332.
 Pepsin : G. A. Zwick, 336.
 " and other Ferments, Glycerine Extracts of, 331.
 Pepsins of Commerce, Value of, 336.
 Permanganate of Potassa, Application of, 428.
 Permanganate of Potash, Injection of, 428.
 Permanganate of Potassium of Pharmacy, 564.
 Peroxide of Iron, Soluble, 172.
 " of Silver, Preparation of, 188.
 Personne, J. : Conversion of Chloral into Aldehyde, 243.
 Pessaries and Suppositories, Mould for, 403.
 Petit, A. : Soluble Iodide of Starch, 190.
 Petroleum Oil, Behaviour of Castor Oil with, 101.
 Peyre and Rabuteau : M'boundou, or Icaja, 61.
 Pharmacopœia, Changes in Nomenclature of, 616.
 Pharmacopœia, Chemical Nomenclature of, 117.
 Phloroghicin, Levulose, and other Sugars, 215.
 Phosphate of Iron, Syrup of, 408.
 Phosphorus, Arsenic in : Rademacher, 159.
 Phosphorus, Black ; Blondlot, 157.
 Physostigmatis, Extractum, 356.
 Pill, Blue : Diehl, 387.
 Pills, Carbolic Acid, 390.
 " Coating of, 390.
 " of Oil of Sandal Wood, 389.
 Pills, Quinine : Diehl, 389.
 " of Sulphate of Quinine, 390.
 Piesse, C. H. : Oxidation Products of Essential Oil of Orange Peel, 546.
 Pineapple Essence, 440.
 " Flavour, 439.
 Pine, Riga : Keller, 102.
 Pinner and Kraemer : Action of Chlorine on Aldehyd, 242.
 Planta-Reichenau : Iva or Achilles, 89.
 Plasters, Liquid Caoutchouc as an Addition to, 355.
 Plumbi Subacetatis, Liq., 182.
 Poison, New Insect, 441.
 Polarisation, Circular, of Castor Oil : Popp, 101.
 Pomades, Colouring for, 442.
 Popp, O. : Circular Polarisation of Castor Oil, 101.
 Popp, O. : Inuloid, a Soluble Modification of Inulin, 194.
 Popp, O. : Occurrence of Ammonia, 168.
 Popp, O. : on Synanthrose, Sugar, 196.
 Poppy Culture in North America, 36.
 " Farming in Queensland, 34.
 Pot Pourri, 445.
 Potash, Permanganate of, Injection of, 428.
 Potash and Manganese, Tartrate of : Deschamps, 263.
 Potassa, Permanganate of, Application of, 428.
 Potassium, Acid Oxalates of : Nichols, 262.
 Potassium, Bromide of, Report on Purity of, 163.
 Potassium, Ethylate of ; a new Caustic, 222.
 Potassium, Ferricyanide of, Preparation of, 266.
 Potassium, Ferricyanide of, Action of Light on, 268.
 Potassium, Iodide of, Precipitation of Quinia by, 283.
 Potassium, Iodide of, Purity of, 163.
 " " Reaction with Sub-nitrate of Bismuth, 181.
 Potassium, Permanganate of, of Pharmacy, Report of, 564.
 Potassium, Sulphocyanide of, Isomeric Modification of, 268.
 Powders, Division of by the Eye, 437.
 Powder, Improved Dover's, 391.
 Prescott, A. B. : Evaporation in Vases, 344.
 President's Address, 535.
 Press, The Tincture, 596.

Proctor, W.: Morphimetric Process for the Pharmacopœia, 287.
 Proximate Principles, Movements in Plants: Deherain, 24.
 Prunes, Medicated, 437.
 Psidium Pomiferum and Pyriferum (Guava), 68.
 Pump, Steam Filter: Dr. Waly, 342.
 Purifying Metallic Arsenic, 159.
 Purnell, J. B. R.: Administration of Quinia, 428.
 Pyrogallie Acid, Oxidation of, 266.

Q.

Queensland, Poppy Farming in, 34.
 Quinia, Administration of, 428.
 " and Cinchonine, Hydrobromates of, 285.
 Quinia, Crystallisation of Sulphocarbonate of, 260.
 Quinia, Morphine, and Strychnine, Syrups of Bromides of, 287.
 Quinia Pills: Diehl, 389.
 " Precipitation of, by Iodide of Potassium from Acid Solutions, 283.
 Quinia Solution for Hypodermic Injection, 431.
 Quinia, Sulphate of, Pills of, 390.
 " Syrup of Phosphate of, 410.
 " Syrup of Phosphate of Iron with, 409.

R.

Rabelle, M.: Vinum Cinchonæ, 422.
 Rabuteau: Estimation of Ammoniacal Salts, 151.
 Rabuteau & Peyre: M'boundou, or Icaja, 61.
 Rademacher, C. J.: Arsenic in Phosphorus, 159.
 Rademacher, C. J.: Crystallisation of Sulphocarbonate of Quinia, 260.
 Radix Galangæ, Historical Notes, 103.
 Raspberry Essence, 440.
 " Flavours, 439.
 Reichardt & Hoehn: Composition of Hyoscyamine, 300.
 Report, Annual, 530.
 Reviews—see Bibliography.
 Reynolds, H. P.: Emulsion of Almonds, 354.
 Reynolds, J. E.: Acetone in Methylated Spirit, 220.
 Rhamnus Frangula, or Black Alder, Bark of, 560.
 Rhatany from Para: Flückiger, 39.
 " Root, Honey of, 436.
 Rhubarb and Mustard, Detection of Turmeric in: Maisch, 100.

Richardson, B. W.: Chloral Hydrate, its Use, 238.
 Richardson, B. W.: Ethylate of Potassium; a New Caustic, 222.
 Richardson, B. W.: Nitrite of Amyl, 224.
 Richardson, B. W.: Syrups of the Bromides of Quinine, Morphine, and Strychnine, 287.
 Richardson, B. W.: Triethyl Ether, 222.
 Rieckher, T.: Aqua Amygdalarum Amararum, 352.
 Riga Pine: Keller, 102.
 Rimmel, E.: Ylang-Ylang, 39.
 Rimmington, F. M.: Castor-oil Soap, 393.
 Rogers, G. G.: Solution of Quinine for Hypodermic Injection, 431.
 Rolle and Dubarth: Carbolic Acid in Smallpox Epidemics, 253.
 Rose Flavour, 439.
 Rose, Moss, Essence of, 445.
 Roses, Milk of, 443.
 Rother, R.: Ointment of Mercuric Nitrate, 418.
 Rother, R.: Pulverisation of Camphor, 391.
 Rubini's Camphor, 434.
 Rue, Oil of, Synthesis of, 249.
 " Wild, or Harmal, Seeds of, 600.
 Rufigallie Acid, 265.

S.

Sabadilla: A. Ernst, 106.
 Saccharate of Iron, 171.
 Saffron, Adulteration of: Hanbury, 102.
 Sale, L. E.: Cucumber Ointment, 421.
 Saline Compounds of Cane-sugar, 206.
 Salts, Ammoniacal, Estimation of, 151.
 Salts Composing the Bones, Substitution of, 170.
 Salts, Crab Orchard: J. T. Viley, 167.
 " of Nitrous-oxide: Divers, 152.
 Sandal Wood, Oil of, Pills of, 389.
 Sanguinarin, 310.
 Santal Wood, Chemistry of, 318.
 Santonine, Solution of, 384.
 Santonin, its Detection in Urine, 315.
 Sauces, 440.
 Savin, Ointment and Cerate of, 420.
 Schäffer, S.: Bromal and its By-Products, 244.
 Scheffer, G.: Liquid and Saccharated Pepsin, 332.
 Schering, G.: Impurities in Reduced Iron, 171.
 Schiff, H.: Synthesis of Conia, 301.

- Schmiedeberg and Koppe: Muscarin, the Alkaloid of the Fly Fungus, 309.
 Schneider, F.: Time for Collecting *Digitalis*, 97.
 Schroff: Activity of *Conium Maculatum*, 98.
 Schulze, M. F.: Assay of Soaps, 326.
 Schweickert, M. H.: Specific Gravity of Solutions of Glycerine, 248.
 Seaweed as a Remedy for Hay Asthma, 431.
 Secale Cornutum, Development of, 111.
 Seeds of Wild Rue, or Hermal, 600.
 Senega, Ipecac., and Squill, Syrups of, 405.
 Senna, Confection of, 353.
 Sesamum Indicum, Gingilie Oil, 98.
 Shiun, J. T.: Solution of Guaiac Resin, for Medicinal Use, 383.
 Shuttleworth, E. B.: Adulteration of Lard, 437.
 Shuttleworth, E. B.: Tincture of Myrrh, 436.
 Siebert: Soluble Peroxide of Iron, 172.
 Silver Chloride, Reduction of, 186.
 „ Preparation of Peroxide of, 188.
 „ Solubility of Chloride, Bromide, and Iodide of, 187.
 Simmonds, P. L.: Opium Trade in China, 27.
 Sinalbin: A Constituent of White Mustard Seed, 317.
 Skey, W.: Poisonous Principle of *Coriaria Ruscifolia*, 325.
 Smallpox, Carbolic Acid in, 253.
 Smee, A.: Parasite on Lemon, 43.
 Smith, F. P.: Chinese Blistering Flies, 17.
 Smith, W. G.: Detection of Santonin in the Urine, 315.
 Smith, T. and H.: Notes on Aloin, 585.
 Snakeroot; Black, a Neutral Principle in, 313.
 Soaps, Assay of: M. F. Schulze, 326.
 Soap, Castor Oil, 393.
 „ Iron, 394.
 „ Watt's Chloridised Sanitary, 394.
 Soda, Carbonate of, Adulteration of, 167.
 „ Crystallised Hydrate of, 167.
 „ Pure Caustic, 166.
 Sodium, Acid Oxalates of: Nichols, 262.
 Sodium, Preparation of Bromide of: Castelholz, 161.
 Solubility of Sulphide of Carbon in Alcohol, 156.
 Solutions: T. B. Groves, 568.
 Solvents for Indigotin, 322.
 Sorbin, Glucose, etc., etc., 215.
 Spill, D.: Xylonite, 219.
 Spigatis, H.: Resin of Tampico Jalap, 320.
 Spirit Methylated, Acetone in, 220.
 „ Loss of, in Making Tinctures of the British Pharmacopœia, 415.
 Spiritus Ammonia Aromaticus, 397, 398, 399.
 Spiritus Salis Dulcis, 399.
 Sponges, Bleaching, 448.
 Springmühl: Preparation of Chloral, 230.
 Squibb, E. R.: Fluid Extracts and their Menstrua, 363.
 Squibb, E. R.: Preparation of Chloral, 226.
 Squill, Seneg., and Ipecac., Syrups of, 405.
 St. Clair Gray: Filtration of Strong Acids, 340.
 Staples, C. A.: Compound Iron Mixture of the Pharmacopœia, 560.
 Staples, C. A.: The Tincture Press, 596.
 Staples, C. A.: Way to Obtain Distilled Water Economically, 602.
 Starch and Cellulose, 188.
 Starch, Soluble Iodide of, 190.
 Steam Filter Pump: Dr. Waly, 342.
 Steinauer, G.: Hydrate of Bromal, 244.
 Stolba, F.: Tinning Copper, Brass, and Iron, etc., 449.
 Strawberry Essence and Flavour, 439, 440.
 Strychnine and Chloral, 431.
 „ Quinine, and Iron, Syrup of Phosphate of, 409.
 Strychnine, Quinine, and Morphine, Syrups of Bromides of, 387.
 Strychnos, Seeds of: Maisch, 94.
 Styptic Wool, 433.
 Succinate of Sesquioxide of Iron, 436.
 Sugar-Beets and Beetroot Distillation, 200.
 Sugar, Cane, Saline Compounds of, 206.
 Sugar, Extraction of, from Beetroot and Cane, 201.
 Sugar, Ferruginous, 173.
 „ Grape, Formation of, in Syrups, 212.
 Sugar, Grape, from Corn, 208.
 „ „ New Method of Determining, 214.
 Sugar, Influence of, on Magnesia used as an Antidote, 169.
 Sugar, Inverted, 204.
 „ Lactic Acid from, 261.
 „ New Test Solution for, 213.

- Sugar Paper, Black Lustre for, 447.
 Sugars, Various, Hlasiwetz and Habermann, 215.
 Sulphate of Ammon-Magnesia, Occurrence of, 168.
 Sulphide of Antimony, Golden, 178.
 " of Carbon, Solubility in Alcohol, 156.
 Sulphocarbonate of Quinia, Crystallisation of, 260.
 Sulphocarbonate of Zinc, 258.
 Sulphocarbolic Acid and the Sulphocarbonates, 254, 257.
 Sulphocarbonic Extracts, 357.
 Sulphocyanide of Potassium, Isomeric Modification of, 268.
 Sulphur Beds of California, 153.
 " New Source of, 153.
 " Ointment of Iodide of, 421.
 Sulphuric Acid, Aromatic, 350.
 Sulphurous Acid for Chilblains, 428.
 " Acid as Disinfectant, 154.
 Sumac, American, 45.
 Sumbulus Moschatius, 88.
 Suppositories, New Material for, 402.
 " and Pessaries, Mould for, 403.
 Suppositories, Preparation of, 399, 404.
 " Wax, Tallow, etc., in, 400.
 Syrup of Cinchona, 404.
 " Easton's, 410.
 " of Iodide of Calcium: O. Eberbach, 165.
 Syrup of Ipecacuanha, 406.
 " Iron Oxide, 173.
 " Iodide of Potassium and Iron, 411.
 Syrup of Iodide of Starch: A. Petit, 190.
 " Phosphate of Iron, 408.
 " Phosphate of Iron, &c., 407.
 " Phosphate of Iron and Lime, 409.
 Syrup of Phosphate of Iron with Manganese, 409.
 Syrup of Phosphate of Iron with Quinine, 410.
 Syrup of Phosphate of Iron, Quinine, and Strychnine, 410.
 Syrup of Phosphate of Iron and Strychnine, 411.
 Syrup of Phospho-lactate of Lime, 411.
 " Phosphate of Manganese, 409.
 " Phosphate of Zinc, 410.
 " the Bromides of Quinine, Morphine, and Strychnine, 287.
 Syrups, Formation of Grape-Sugar in, 212.
 Syrups of Senega, Ipecac., and Squill, 405.
 Syrupus Calcis Lacto-phosphatis, 411.
 " Croci, 405.
 " Tolutani, 407.
 Synanthrose, a Sugar contained in the Synantheres, 196.

 T.
 Taffe, B.: Rufigallic Acid, 265.
 Tamarind: J. R. Jackson, 59.
 Tampico Jalap, Resin of, 320.
 Tannin and Glycerine Pencils, 430.
 " Preparation of, 265.
 Taps, Wooden, to prevent their Cracking, 449.
 Tartaric Acid, Prevention of Mouldiness in Solutions of, 262.
 Tartrate of Manganese and Potash: Deschamps, 263.
 Tetrabromide of Carbon: Bolas and Groves, 162.
 Theine, Preparation of, etc.: Thompson, 314.
 Thompson, L.: Uses, etc., of Theine, 314.
 Tichborne, C. R. C.: Acetum Cantharidis, 349.
 Tichborne, C. R. C.: Changes in the Nomenclature of the Pharmacopœia, 616.
 Tichborne, C. R. C.: Liq. Epispasticus and Vesicating Collodion, 381.
 Tichborne, C. R. C.: Parchment Paper as a Filtering Medium, 338.
 Tichborne, C. R. C.: Solubility of Cantharidine, 318.
 Tichborne, C. R. C.: Vesicating Collodion, 352.
 Tidy and Woodman: Potassic Iodide with Subnitrate of Bismuth, 181.
 Tinctura Opii Camphorata, 434.
 Tincture of Ailanthus, 45.
 " of Calabar Bean, 414.
 " of Eucalyptus, 68.
 " Holbeck, 434.
 " of Hyoscyamus, 412.
 " of Iodine, Decolorization and Deodorization of, 413.
 Tincture of Myrrh, Utilization of Residue in making, 436.
 Tincture of Nux Vomica, 414.
 " Press, 596.
 Tinctures of the British Pharmacopœia, Loss of Spirit in making, 415.
 Tinfoil, Lead in, 424.
 Tinfoil for Preserving Substances on Exposure to Air, 422.
 Tinning Copper, Brass, and Iron in the Cold, etc., 449.
 Toilet Vinegar, 445.

Tolu, Syrup of, 407.
 Tonqua Bean, Flavour of, 439.
 Triethylic Ether, 222.
 Tuchsmidt and Follenius : Sol. of Sulphide of Carbon in Alcohol, 156.
 Turmeric, Detection of, in Mustard and Rhubarb : Maisch, 100.
 Turmeric Root, Curcumin the Colouring Matter of, 323.
 Tuson, R. V. : Comparative Value of the Pepsins of Commerce, 386.
 Tylophora Asthmatica, M. C. Cooke, 93.

U.

Uloth, Dr. : Mercurous Chloride, Preparation of, 185.
 Umney, C. : Test for Hydrate of Choral, 232.
 Umney, C. : Nitrate of Amyl, 224.
 „ Loss of Spirit in making Tinctures, 415.
 Unona Odoratissima : E. Rimmel, 39.
 Ung. Aq. Rosæ, 435.
 Unguentum Acidi Carbolici, 421.
 „ Hydrargyri Oxidi Rubri, 419.
 Unguentum Sabinæ, 420.
 „ Sapo Ferrico, 395.
 Uric Acid : Gibbs, 330.
 Urine, Confirmatory Test for Albumen in, 329.
 Urine, Detection of Santonin in, 315.
 Uva Ursi, Arbutin from, 304.

V.

Vacciniin, from the Leaves of the Cowberry, 312.
 Vacuo, Partial, Distillation in, 342.
 „ Evaporation in, 344.
 Vanilla Crystals : Carles, 319.
 „ Flavour, 439, 440.
 Varnish, Wax, for Waxed Paper, 447.
 Venezuela, Cinchona Cultivation in, 72.
 Ventilating and Freezing Machine, 419.
 Verbascum Thapsus, 96.
 Versmann, F. : Chloral Hydrate and Chloral Alcoholate, 235.
 Vesicating Collodion, 352.
 Viley, J. T. : Crab Orchard Salt, 167.
 Vinegar, Toilet, 445.
 Vinum Cinchonæ, 422.
 Voelcker, A. : Sugar-Beets and Beetroot Distillation, 200.
 Vogel, A. : Lead in Tinfoil, 424.
 „ H., Action of Light on Red Prussiate of Potash, 268.

Volumetric Estimation of a Persalt of Iron, 177.

Vrij, E. J. de : Polarized Light for Determining Value of Cinchona Bark, 273.

W.

Walz, Dr. : Steam Filter Pump, 242.
 Wanklyn, J. A. : Constitution of Albumen, 329.
 Ward, J. S. : Cultivation of Opium in Australia, 32.
 Wartha, V. : Solvents for Indigotin, 322.
 Warts, Cure for, 429.
 Water, Distilled, Way to obtain economically, 602.
 Water, Florida, 445.
 Waters of the British Pharmacopœia, 350.
 Waterproofing, 448.
 Watt's Chloridised Sanitary Soap, 394.
 Wax of Opium, 297.
 Wax Varnish for Waxed Paper, 447.
 Webb, E. A. : Adulteration of Chiretta, 92.
 Weidel, H. : Santal Wood, 318.
 Wenzell, W. T. : Cincho-Quinine, 285.
 Wenzell, W. T. : Preparation of Ferricyanide of Potassium, 266.
 Wharton, J. C. : Syrups of Senega, Ipecac., and Squill, 405.
 Will, H. : Sinalbin, a Constituent of White Mustard Seed, 317.
 Willetts, J. : Liquid Caoutchouc as an Addition to, 355.
 Wimmel, T. : Melting and Solidifying Points of Fats, 326.
 Wood, C. H. : Test for Hydrate of Chloral, 233.
 Wood, C. H. : Preparation of Liquor Bismuthi, 614.
 Wood, W. H. : Prevention of Mouldiness in Aqueous Solutions of Tartaric Acid, 262.
 Wood, Santal, Chemistry of, 318.
 Wooden Taps, to Prevent their Cracking, etc., 449.
 Woodman and Tidy : Potassic Iodide, with Subnitrate of Bismuth, 181.
 Wool, Styptic, 433.
 Worlée, E. H. : Practical Battery for Electro-Theraputists, 346.
 Wright, C. R. A. : New Derivatives from Codeia, 548.
 Wright, C. R. A. : Oxidation Products of Essential Oil of Orange Peel, 546.

Wright, C. R. A. : Sp. Gr. of Hydrobromic Acid, 160.

Wurtemberg, Opium Cultivation in, 81.

Wurtz, F. : Golden Sulphide of Antimony, 178.

X.

Xylonite : D. Spill, 219.

Y.

Ylang-Ylang : E. Rimmel, 89.

Z.

Zinc, Sulphocarbolate of, 258.

„ Syrup of Phosphate of, 410.

Zizyphus Bug, 18.

Zwick, G. A. : Pepsin, 336.



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*Extract from "Pharmaceutical Journal" of May 1, 1856,
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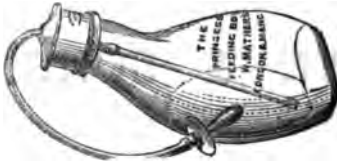
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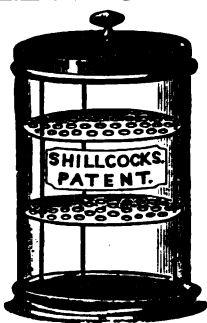
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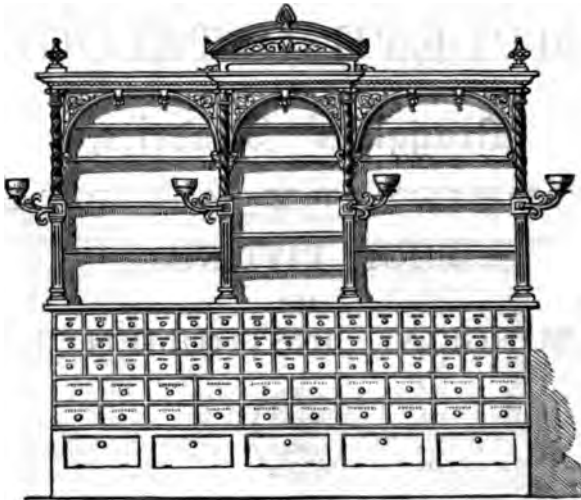
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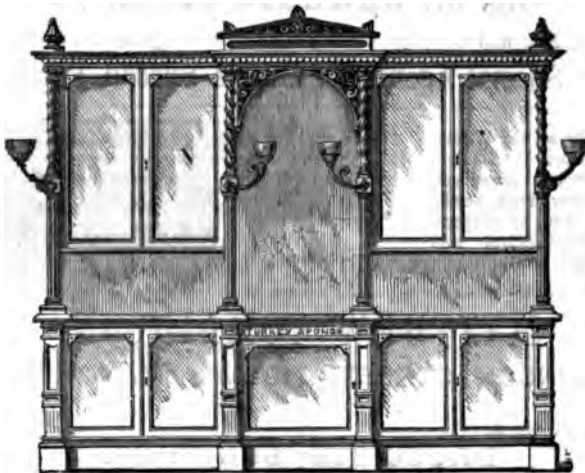
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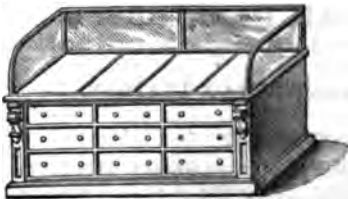
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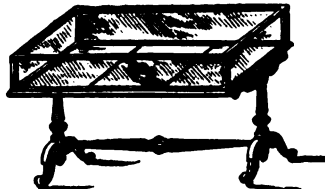


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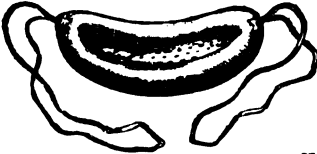
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3.	Metallic, Silk Velvet Pads	"	18 0	2 6
4.	Silver plated Wire, ditto	"	21 0	3 0
5.	Ditto ditto	Square	28 0	4 0
6.	Ditto, Elastic Mouthpiece	"	30 0	4 0
7.	Gold ditto, Silk Velvet Pads	"	48 0	7 6
8.	Threefold Silver plated, Velvet Pads and Silk Mouthpiece	"	36 0	6 0
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MADE BY STEAM POWER.

And composed of "PURE SILVER AND LARD," is the only Preparation for the perfect cure of the SCAB. Sold in Tins of 14, 28, 56, and 112 lbs. and upwards. Small bills and posters supplied to the Trade, if required. For further particulars, apply to

J. H. THOMAS & SON,

Wholesale Chemists and Soda-Water Manufacturers,

BOSTON.

Established 1824.

MOOR'S MEDICAL PLASTER MANUFACTORY.

ESTABLISHED MORE THAN 56 YEARS.

REMOVED TO MORE COMMODIOUS PREMISES,

AT THE

SALTISFORD, WARWICK.



MR. MOOR gratefully thanks his friends for their kind support since he has resumed business at the above address, and begs to say he can now supply his well known plasters promptly and in any quantity.

CAUTION.—Order Moor's Plasters, and Observe his best makes are in wrappers bearing the signatures,

William Moor
James Bay.

London Agents: Messrs. NEWBERRY & SONS, 37, Newgate St.



YOUNG'S IMPROVED

Arnica White Felt Corn and Bunion Plasters

Have established for themselves a world-wide reputation. They are acknowledged to be the best in the market. They are the best ever invented for giving immediate ease, and removing those painful excrescences.

Observe the Trade Mark, H.Y., without which none are genuine. Be sure and ask for YOUNG'S.

DRAFTS AND POST-OFFICE ORDERS PAYABLE TO

H. YOUNG, 16, Carthusian St., Aldersgate St., London, E.C.

Be careful that Young's are supplied when ordered.

LIEUT. JAMES'S BLISTER.

CAUTION.

The only genuine BLISTER OINTMENT is that for which the Messrs. BARCLAY & SONS, 95, Farringdon Street, London, and Messrs. RAIMES & Co., Edinburgh, have been Agents for upwards of thirty-eight years, and bears the Signatures of the Proprietors, "R. S. JAMES & J. JAMES," on the top label of every pot.

This BLISTER is now and has been manufactured and supplied to the above firms by me, R. S. JAMES, only, for upwards of the last twenty-five years. (*Beware of spurious imitations.*)

Agents recently appointed:—Messrs. SUTTON & Co., Bow Churchyard; W. EDWARDS, 38, Old Change; NEWBERRY & SONS, 44, St. Paul's Churchyard; SANGER & SONS, 160, Oxford Street; KEATING & Co., 79, St. Paul's Churchyard; and E. CLAVER, 68, Oxford Street, London; BOILKAU & BOYD, Bride Street, Dublin; and by all Chemists.

The "TRADE" and the "PUBLIC" are particularly cautioned against a spurious imitation of this BLISTER, and should see that the two names of the Proprietors are on the top label of every pot.

ADVERTISEMENTS.



FLUID Extract of PALMA CHRISTI, for Promoting the Flow of Breast Milk.
 "I have given this Preparation in a variety of cases, and with marked success,—the flow of Breast Milk has considerably increased."—**DR. ROUTH.**
 See *Lancet* and *Medical Times* of December 24th, and *British Medical Journal* of December 7th.
 Sold Retail in 6 oz. bottles, 3/-, or double, 5/6.
 Handbills, with Testimonials and Show-cards, free.
 May be obtained through any Wholesale Druggist and Patent Medicine Warehouse, or Direct from
THOMAS GREENISH, 20, New Street, Dorset Square.

PURE ESS. LEMON AND BERGAMOT.
DO. FRENCH POMADES AND OILS.
DO. ROSE AND ORANGE FLOWER WATERS.
DO. OTTO ROSES (VIRGIN).
DO. OILS, NEROLI, ROSEGERANIUM, YLANG YLANG,
SANDALWOOD, TEC.

The Trade are respectfully informed, that of the above articles (which we use largely in our own manufactures), we keep and sell none but a "pure quality," and shall be happy at any time to quote prices or submit samples, believing that the same will compare favourably with those of other houses.

R. LOW, SON & HAYDON, 148, Strand, London.

Greensill's Far-Famed Mona Bouquet,
 THE ORIGINAL AND ONLY GENUINE.

TRADE PRICE—9s., 15s., and 30s. per dozen.

The favourable reception and increasing popularity of this exquisite Perfume is a proof of its excellent quality.

T. S. GREENSILL, 78, STRAND STREET, DOUGLAS, ISLE OF MAN,
bonâ-fide Proprietor.

AGENTS.—LONDON: J. Sanger & Son; S. Maw, Son & Thompson; Wm. Edwards; F. Newbery & Sons; Wm. Mather; Barclay & Sons; Whitaker & Grossmith. LIVERPOOL: Evans, Sons & Co.; Clay, Dod & Case; R. Sumner & Co.; Baines & Co. MANCHESTER: J. Woolley; Lynch & Bateman. EDINBURGH: Duncan & Flockhart; Sang & Barker. DUBLIN: M'Master, Hodgson & Co. YORK: Sutcliffe & Headley; Clark, Blensdale & Co. THIRSK: Wm. Foggitt. BRISTOL: Pearce & Co. LEEDS: Goodall, Backhouse & Co.

Trade Mark—**TOWER OF REFUGE.**

Rimmel's Christmas Nobelties.



Christmas Sachets, from 6d.
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 Fancy Crackers for Balls and Parties: Rosewater & Costume, 3s. 6d., Oracular, 3s. 6d., Floral, 3s. 6d. Lottery, 4s. per doz.
 Rimmel's Perfumed Illuminated Almanac (Heroes of French Poets). 6d., by post for 7 stamps.
 Wholesale Lists on application to 96, Strand. The usual allowance to the Trade.
EUGENE RIMMEL, Perfumer to H.R.H. the Prince of Wales, 96, Strand; 128, Regent Street; 24, Cornhill, London.

Established 1800.

FINE PERFUMED SOAPS.**JOHN RICHARDSON & CO.**

Are the sole Inventors of the only Genuine Toilet Soaps; viz., OATMEAL and HONEY; PURE GLYCERINE, scented and unscented; their highly scented CAMPHOR and HONEY SOAP, so much approved of; the celebrated GLYCERINE and HONEY SOAP, a combination of pure Honey and Glycerine. All of the above Soaps are sold by the cwt., cut and stamped in Tablets and Squares. J. R. & Co. particularly recommend the above as being articles as named, and prepared on chemical principles. Imitations of our preparations are prevalent.

J. R. & Co.'s Brown Windsor, Honey, Glycerine, Rose, Almond, White Windsor, and other Toilet Soaps, are guaranteed pure Tallow Soaps, not the adulterated compounds sold at a cheap rate, the base of which is Cocoa Nut Oil,—an article never used by J. R. & Co.

JOHN RICHARDSON & Co.'s Concentrated Flower Essences are unequalled in strength and perfume. Every known perfume in above can be procured from their Laboratory, their No. 24 Pomades, Cassie, Tuberose, Jonquil, Vanilla, Fleur d'Orange, Rose, Millifleur, Violette and Jasmin.

Laboratory for Flower Perfumes, and Manufactory for Soaps and Pomades, 1 and 2, NEW STREET, BISHOPSGATE STREET. Manufactory and Warehouse for every article of the Toilet, 30, BISHOPSGATE STREET WITHOUT, LONDON, E.C.

Sole Inventors of the only Genuine Glycerine and Almond Soap.

PRICE LISTS ON APPLICATION.

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WHITAKER & GROSSMITH'S PURE WHITE GLYCERINE SOAP.

Richly perfumed, and possessing the Emollient and Cosmetic properties of Glycerine for the Skin and Complexion.

1s. 6d. Boxes of Three Tablets. 12s. per Dozen Boxes.

NOTE.—The extraordinary merit and consequent unprecedented demand for WHITAKER & GROSSMITH'S PURE WHITE GLYCERINE SOAP, has caused numerous unprincipled imitations of their new style of Box and Labels. To save disappointment, purchasers should carefully observe the name of the Sole Proprietors, WHITAKER & GROSSMITH, Perfumers, London.

W. & G. also beg to solicit notice of their other "Specialities," comprising:—CENTFLEUR, JOCKEY CLUB, REAL OLD MUSK, SANDBRINGHAM, SEMI-CUT BARS, NEW OVAL and ASSORTED SOAP TABLETS, CENTFLEUR POMADE and OIL, OLEINE, BRILLIANTINE, CANTHARIDINE, and LIME CREAMS, &c. CENTFLEUR, PEARL OF PERFUMES, and other Bouquets, ANGLO-COLOGNE, LAVENDER WATER, &c., with Patent Sprinkling Caps. All of acknowledged merit, and put up in attractive forms, which command a ready and increasing sale.

Sample Orders, Price Lists, and Terms of the Manufacturers, 120, Fore Street, City, London, E.C.

RECOMMENDED BY THE FACULTY.

THOMAS'S SODA-WATER.

THOMAS'S POTASS WATER.

THOMAS'S LEMONADE.

LITHIA WATER, prepared under the direction of Dr. Garrod.

GERMAN SELTZER WATER. VICHY WATER. SOLU. MAGNES. BICARB (15 grs. in fluid ounce).

Each bottle of the Alkali Water is protected by a label over the cork, with his signature, and all the corks are branded, "THOMAS, Boston."

Sold by all respectable Chemists, Confectioners, and Hotels.

MANUFACTORY—BOSTON.

Carriage paid on Twelve Dozen.

PURE AERATED WATERS,

T. & F. J. TAYLOR,

NEWPORT PAGNELL.

(Established upwards of Thirty Years.)

Tooth Brushes, Hair Brushes, &c.,

OF EVERY KIND AND QUALITY.

COATE & CO.,

41, LISLE STREET, LEICESTER SQUARE, LONDON,

And Nimmer Mills, Somersetshire.

PRICE LISTS FORWARDED ON RECEIPT OF BUSINESS CARD.

GEORGE SALTER'S CENTRAL BRUSH WAREHOUSE,

29, RED LION SQUARE, HOLBORN, W.C., LONDON. ESTABLISHED 1830.

HAIR, TOOTH, AND NAIL BRUSHES, COMBS, &c. PROPRIETARY ARTICLES.

Special! MAHOGANY TOOTH BRUSH CASE—Bent Plate Glass, Three Glass Shelves and One Tray, 17 in. x 12 in. x 14 in., 36s. BEST TOOTH BRUSHES, 72s. per gross.

10 per Cent. Discount prompt Cash.

KENT'S BRUSHES.

Notwithstanding the great rise in the price of bristles, the quality of the Brushes made by G. B. KENT & Co. remains the same. The advance in cost is carefully calculated, and such advance only is made as is necessary to maintain the standard quality.

Improved Steam Machinery is used to reduce the cost of labour, and no adulteration, or alteration in quality or size is permitted.

The Trade throughout the world may obtain, on application—

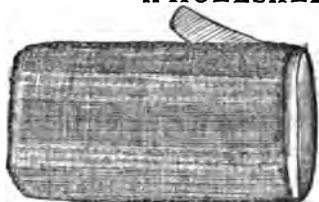
G. B. Kent & Co.'s Illustrated Catalogue of Brushes.

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11, GREAT MARLBOROUGH STREET, LONDON, W. ESTABLISHED, 1777.

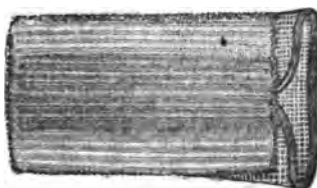
NOTICE TO THE TRADE. DINNEFORD & CO. (the Original Patentees)

Bag to announce that they have resumed the Manufacture, on their own Premises, and with Improved Machinery, of
Horse-Hair Friction Gloves, Belts, Bath Brushes, Oxford and Cambridge Pads, &c., &c.
In white, grey, and black hair, of various degrees of hardness, to suit the most delicate without risk of injury to the skin.
WHOLESALE PRICE LIST.



LADY'S AND GENT'S FLESH GLOVE (in Pairs).

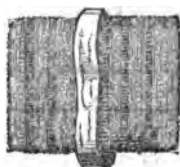
Nos. 1 and 2 sizes, 38s.; No. 3, 40s. per doz. pairs. Retail, 5s.



PRINCE OF WALES BATH GLOVE,

For wet or dry use. 18s. per doz. Retail, 2s. 6d. each.

HORSE GLOVE BRUSH. 42s. per doz. Retail, 6s. each.



CLARENDON FLESH RUBBER.

Hair on both sides. One surface is soft, the other hard; either may be used for friction. 24s. per doz. Retail, 3s. 6d. each.



ARMY BATH PAD.

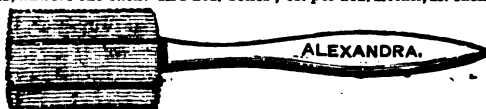
For wet or dry use. Hair on both sides. A Luxury for the Bath. 12s. per doz. Retail, 2s. each.

OXFORD WASHING PAD.

For cleaning and softening the hands, and for the bath. In 1 doz. boxes; 8s. per doz. Retail, 1s. each.

ALEXANDRA BATH BRUSH.

Hair on both sides, on a long handle. 20s. per doz. Retail, 2s. 6d. each.

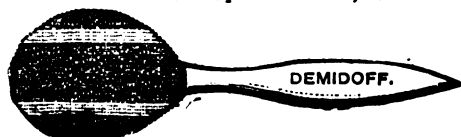


CAMBRIDGE PAD.

Hair on both sides: for softening the hands and for the Bath. 10s. per doz. Retail, 1s. 6d. each.

THE DEMIDOFF.

42s. per doz. Retail, 5s. each.



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Hair on one side, fine sponge on the other, well set on a handle. Answers the double purpose of a sponge and flesh brush. 42s. per doz. Retail, 5s. each.

FLESH STRAP OR BELT, AND BATH STRAP.

40s. per doz. Retail, 5s. each. LADIES' quality, light hair and soft pile. GENTS' quality, black or grey, and pile of various degrees of hardness.

172, NEW BOND STREET, LONDON, W.

MANUFACTORY: FOLEY WORKS, OGLE STREET, MARYLEBONE.

Wholesale Agents: MAW, SON & THOMPSON, 11 & 13, Aldersgate Street, E.C.

SODA-WATER MANUFACTORY,

ESTABLISHED 1836.

SODA-WATER, | SELTZER-WATER,
LEMONADE, | POTASH-WATER,
ETC., ETC.

MANUFACTURED BY

J. BINGLEY (late Greville & Co.),
PHARMACEUTICAL CHEMIST,
NORTHAMPTON.

Carriage Paid quantities of Six Dozen and upwards.

From the increasing sale of these Waters the Manufacturer is induced to bring them more prominently before the public. He would be pleased to send a Sample Case, containing an assortment, *gratis* and *carriage paid*, to any respectable Chemist, on receipt of Business Card.

GOOD BUTTER IN HALF AN HOUR.

CAUTION.—H. GOODALL, DERBY, is the original Inventor and Manufacturer of the

CELEBRATED BUTTER POWDER,

For separating all impurities from the cream, and saving labour in churning.
Invented 1841.

Prepared and Sold by the original Inventor, H. GOODALL, Derby.

Wholesale by the London and Liverpool Houses, in packets at 3d., 6d., 1s., 2s. 6d., and 5s. each.

GOODALL'S PATENT GRINDING MACHINES.

With 13-inch Wedgwood Mortar, £7 each.

THE WREXHAM SAUCE has now attained for itself such a name as to have superseded many older and better known Sauces, as the following Testimonials (taken from numerous others) will show:—

From A. D. WHITE, Esq., M.D., M.R.C.P., M.R.C.S., F.R.G.S., Superintendent in Her Majesty's Emigration Service.

"Edisbury's Wrexham Sauce I found to be both pleasant to the palate and beneficial to digestion. It is peculiarly adapted for Sea use, inasmuch as it is a Capital Soup Sauce; a Teaspoonful of it is the greatest improvement to Pea Soup that can be imagined."

From Mr. WARD, Bedford Hotel, Covent Garden, London.

"Amongst the Patrons to my Hotel are several eminent Literary and Professional men, and with them the unqualified opinion is, that the 'Wrexham Sauce' possesses merits which no other Sauces do."

From Messrs. PAUL BEDFORD and J. L. TOOLE, Theatre Royal, New Adelphi, London.

"We dined at the Star and Garter Hotel, Richmond, when your Wrexham Sauce was introduced, and a more delicious mixture we never tasted."

LONDON AGENTS—Barclay & Son, Farringdon Street; Davy, Yates & Co., New Park Street, Southwark.
LIVERPOOL—Evans, Sons & Co., Hanover Street; Clay, Dodd & Case, St. Ann Street; Sumner & Co., COVENTRY—Wiley & Brown. CHESTER—Grindley & Son.

It is Retailled in 1s. and 2s. Bottles at 6s. and 15s. per doz., Show Cards and Handbills of Testimonials included, and may be had from any of the above-named Agents, or direct from the Proprietor.

J. F. EDISBURY, CHEMIST, 3, HIGH STREET, WREXHAM.

TRADE NOTICE.

THE CELEBRATED
YORKSHIRE RELISH,

The Best, Cheapest, and Most Delicious Sauce in the World.

100,000 Bottles Sold Monthly.

6d. Bottles as large as most others Sold at 1s.

It is well worthy the attention of Shippers and others, as it bears a good profit, sells readily, gives satisfaction, improves with age, and keeps good in any climate.

Retail, 6d., 1s., and 2s. Bottles. Wholesale, 4s. 6d., 9s., 18s. per doz.

Subject to Discount when quantity is taken.

Sole Manufacturers, **GOODALL, BACKHOUSE & CO., LEEDS.**

Purveyors to the Contractor of the London International Exhibition, 1871.

Price Lists of Druggists', Grocers', and Italian Warehousemen's Sundries to be had on application.

NOT THE CHEAPEST, BUT THE BEST

EXTRACT OF MEAT

IS THAT PREPARED BY STEAM FROM
PRIME ENGLISH BEEF.

This Extract is steadily preferred to all Foreign Extracts, for its superior qualities and delicacy of flavour.

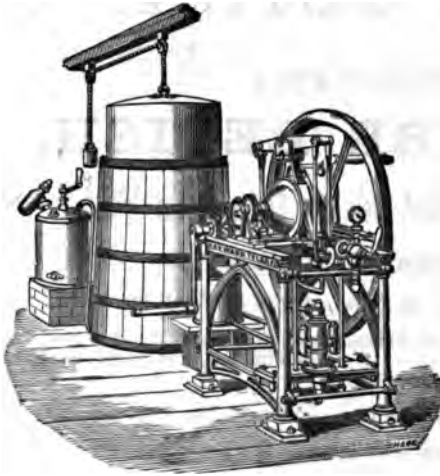
Jars containing—	Retail.	Trade, per dozen.
1½ oz. (equal to Three Pounds of Fresh Beef)	3/-	27/-
3 oz. (equal to Six Pounds " ")	5/6	50/-
6 oz. (equal to Twelve Pounds " ")	10/6	100/-

If preferred, can be had without the Makers' names.

PREPARED BY

HARVEY & REYNOLDS,
13, BRIGGATE STREET, LEEDS.

Sold Wholesale by the Makers; by W. EDWARDS, 88, Old Change; BARCLAY & SONS, Farringdon Street; NEWBERRY & SONS, Newgate Street; and J. SANGER & SONS, 150, Oxford Street, London; THOMPSON & CAPPER, Liverpool; H. B. BRADY, Newcastle-on-Tyne.



HAYWARD TYLER & CO.'S SODA-WATER MACHINES.

These Soda-Water Machines are superior to any others manufactured in workmanship, power, and simplicity. They are packed for exportation without taking to pieces.

Powerful and Ornamental Steam-Engines and all kinds of Soda-Water Machinery made to order. A large Stock kept of MARBLE SODA-WATER FOUNTAINS, Complete with Electro-Silvered Cocks, Copper Cylinders, &c.

BOTTLING WIRE, CORKE, ACIDS, WAITING, STYRUPS OF ALL KINDS, &c. TO ORDER.

Diagrams and Prices sent post free on application at the MANUFACTORY, 84 & 85, UPPER WHITECROSS ST., LONDON, E.C.

H. T. & Co. are the *Original Makers* of the CONTINUOUS PROCESS MACHINES in the form now universally adopted in the trade, and the *Patentees* of the BEAM ACTION MACHINES.

COMPOUND HYDRAULIC PRESS, *Suited to Small Laboratories.* FOR EXTRACTING TINCTURES, &c.



DESGOFFE'S PATENT.

HAYWARD TYLER & Co.,

Sole Licencees for Great Britain.

The superiority of the hydraulic press over all other means of extracting tinctures is acknowledged. Pharmacutists will find this form of press to be compact, powerful, and economical in the highest degree.—*Vide Pharmaceutical Journal*, Oct. 7th, 1871, page 284 and elsewhere.

84 & 85, UPPER WHITECROSS STREET, LONDON, E.C.

BURROW'S PATENT RACKS, FOR THE SAFE STORAGE OF SELTZER, SODA, & ALL AERATED WATERS.



*All
Breakage
prevented,
and the
Waters kept
in perfect
condition in
the smallest
possible
space.*

Rack for 12 doz. Bottles. Size, 33 by 33 by 12 inches.

STOCK RACKS, to hold Two, Three, Four, and Six gross, at £1 per gross, less 25 per cent.

SMALL RACKS, for Counter and Shop Floors, and for Retail Sale.

For 2 dozen Bottles	9s.	For 6 dozen Bottles	20s.
" 3 " " "	12s.	" 12 " " "	30s.
" 4 " " "	15s.	<i>Less 25 per cent.</i>	

WHOLESALE OF THE PATENTEES,

W. & J. BURROW, MALVERN;

And of S. MAW, SON & THOMPSON W. MATHER,

And Druggists' Sundrymen generally.

Manufacturers of the CELLULAR "SAFETY" IRON WINE BINS,
with separate rest for each Bottle.



HOOPER'S BRIGHTON SELTZER

Per **2/6** doz.

SIX DOZEN CARRIAGE FREE.

TRADE LIST.

			s.	d.	
BRIGHTON SELTZER	..	..	half-pints	2 6	per dozen
"	"	..	pints	3 6	"
"	"	..	quarts	4 6	"
BRIGHTON VICHY	..	..	half-pints	2 6	"
"	"	..	pints	3 6	"
"	"	..	quarts	4 6	"
PURE POTASH	..	..	..	2 6	"
" SODA	..	..	..	2 0	"
LEMONADE	..	..	..	2 6	"
LITHIA (5 grs. each bottle)	..	..	..	4 0	"

Mixed Orders under 1 gross, to be Carriage Paid, must include 6 doz., of one kind.

GERMAN SELTZER WATER.

ORIGINAL HAMPER, containing 60 quarts	... ..	£1 10 0	10 per cent
" " 60 pints	... ..	1 0 0	cash.

No Charge for Packages in taking Original Hampers.

Per dozen quarts, 6s. Per dozen pints, 4s.

HOOPER,

Manufacturer and Importer of Mineral Waters,

7, PALL MALL EAST, LONDON. LABORATORY, MITCHAM.

PARIS EXHIBITION, 1867, **TWO GOLD MEDALS.**
 FOR BEST QUALITY, AND AS FOUNDERS OF A NEW INDUSTRY.
 HAVRE EXHIBITION, 1868, **THE GOLD MEDAL.**
 AMSTERDAM EXHIBITION, 1869, **GRAND DIPLOMA OF HONOUR,**
 BEING THE FIRST PRIZE, AND SUPERIOR TO THE GOLD MEDAL.

LIEBIG COMPANY'S EXTRACT OF MEAT,

Manufactured by LIEBIG'S EXTRACT OF MEAT COMPANY, Limited,

43, Mark Lane, London,

AT THEIR MANUFACTORIES IN SOUTH AMERICA.



This extract is supplied to the British, French, Prussian, Russian, Dutch, Italian, and other Governments, in preference to all other Extracts.

ANALYSED AND CERTIFIED GENUINE BY BARON LIEBIG,

One Pound of this Extract contains the soluble parts of 34lbs. of FINE BEEF, free from fat and gelatine, corresponding with about 45lbs. of English butchers' meat, inclusive of the usual quantity of fat and bones.

It is not only used for medical, but much more extensively for household purposes, and is the cheapest and finest flavoured stock for soups, entrées, sauces, etc., at the present retail price of 11s. per lb. Extract, a pint of delicious beef tea costs two-pence farthing, whilst made from fresh meat it would cost about one shilling.

CAUTION !

This is the ORIGINAL EXTRACT, manufactured under Baron Liebig, the Inventor's, control and guarantee; every GENUINE Jar bears HIS SIGNATURE thus, and THAT of his DELEGATE, Professor Max von Pettenkofer.

J. Liebig

Max von Pettenkofer

DELEGATE.

The name of "Liebig's Extract of Meat," being applied, contrary to Baron Liebig's expressed will, and without his guarantee of genuineness, to all sorts of Extracts of Meat, the Public are cautioned not to allow the substitution of any other sort for this Company's genuine article, which should distinctly be asked for by the name of

LIEBIG COMPANY'S EXTRACT.

Require BARON LIEBIG'S SIGNATURE upon every jar.

Sold by all Chemists, Grocers, Italian Warehousemen, Provision Merchants, and Ship Chandlers.

IMPORTANT TO CHEMISTS.

W. H. ATKINSON'S
CHAMPION PLATE POLISH,

For Cleaning and Polishing all kinds of Silver,
Plated Goods, Kitchen Utensils, Plate
Glass Windows, &c.

Every Chemist should keep in Stock the "CHAMPION PLATE POLISH," as it is daily increasing in demand amongst the Nobility, Gentry, and General Public, who like to see their Plate, &c., look clean and bright with the least possible cost and labour.

INVALUABLE
FOR
SAVING TIME
AND
LABOUR.
...
ONE TRIAL
WILL
INSURE
ITS
CONSTANT
USE.



UNRIVALLED
FOR
BRILLIANCY
AND
DURABILITY.
...
GUARANTEED
FREE FROM
MERCURY OR
ANY OTHER
NOXIOUS
INGREDIENT.

This article is done up in boxes of different colours, and sold to the public at Sixpence each.

Most liberal terms allowed by the Wholesale Houses:—
Messrs. Maw, Son & Thompson; Barclay & Sons; Sutton & Co.; E. Edwards; G. B. Kent & Co.; R. Millard & Sons
Dixon, Dean & Co.; Lynch & Co.; W. Mather, &c.

INDEX TO ADVERTISEMENTS.

	<i>Page</i>
Atkinson's Champion Plate Polish	702
Attfield's Chemistry (Van Voorst)	660
Baildon's India-rubber Capsules	686
Barber's (G.) Publications	668
Barron, Squire & Co.'s Trade Notice	669
Beale's (Dr.) Works	668
Bingley's Soda Water, &c.	696
Bostock's Medicated Lozenges	670
Bourne and Taylor's Respirators and Floating Light	688
Bowerbank's Pure Spirits of Wine	672
Braithwaite's Classes for Students	666
Brewer & Marston's Syr. Ferri Phosph. Co.	670
Brown (G.) & Sons' Druggists' Sundries	678
Buckle's Laboratory and Mills	672
Bullock & Reynold's Pepsina Porci	668
Burgess & Willow's Sheep Ointment, &c.	690
Burrow's Patent Racks	699
Chloralum—the New Disinfectant	665
Churchill (J. & A.) Books	662, 664
Churchill (J. & A.) Text Books for Students	661
Coate & Co.'s Tooth Brushes	694
Darling's American Dentifrice (Coffin's)	688
Dinneford & Co.'s Horse Hair Goods, &c.	695
Dixon, Dean & Co., Druggists' Sundriesmen	675
Dobell's (Dr.) Works	668
Durand's Medicated Flannel	686
Edisbury's Wrexham Sauce.	696
Epps & Co.'s Homœopathic Medicines	684
Fannin & Co. (Neligan's Medicines)	662
Ferris & Co.'s Nepenthe	673
Foot, Barrett & Temple, Manufacturing Chemists	674
Foulkes' Cement	687
Gardner & Ainslie, Manufacturers of Decoctions	674
Goodall, Backhouse & Co.'s Yorkshire Relish	697
Goodall's (H.) Butter Powder and Grinding Machines	696
Goosey & Rogers' Plasters	690
Gould & Son's Homœopathy	684
Gowing's Printing Offices	668
Greenish's Palma Christi	692
Greensill's Mona Bouquet	692
Grillon's Tamar Indien	686
Hancock's India-rubber Goods	686
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Jones (T.) Classes for Students	666

	<i>Page</i>
Kent & Co.'s (G. B.) Brushes	694
Kent & Son's French Wine Vinegar	672
Kiddle's James's Fever Powder	668
Kidd's Methylated Spirits of Wine	672
Leath & Ross, Homœopathic Pharmacies	685
Lescher's (F. H.) "Elements of Pharmacy"	662
Liebig Company's Extract of Meat	701
Low, Son & Haydon's Essences, &c.. . . .	692
Lynch & Co.'s Druggists' Sundries	679
Mason's Paraffin Measures	688
Mason's Perfumed Carbolic Acid	670
Mather's Feeding Bottles, Plasters, Sundries, etc.	677
Mather's Price Current	676
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Millard & Sons, Druggists' Sundriesmen	675
Mohr's Silver Anodyne	688
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Morson & Son's Pepsine and Kreosote	673
Muter's Classes for Students	666
Newbery & Sons, Patent Medicine Vendors	682
Orchard's Sugar Coated Pills	670
Orpe's Compound Perfume	667
Peacock's Debt Recovery Offices	668
Rich's (S. G.) Chemical Analyses	667
Richardson & Co.'s Perfumed Soaps	693
Rimmel's Christmas Novelties	692
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Shillecock's Patent Leech Vase	678
Silverlock's Poison Labels	663
Stent's Dentistry	688
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Turner's Cough Emulsion	682
Varley's Leeches and Sponge	690
Walker (G.), Drug Commission Agent	674
Warner, Carter & Co., Wholesale Druggists	674
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Young's White Felt Corn Plasters, etc.	691

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